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## TRADABLES

### Developing output and price measures for Australia's tradable and non-tradable sectors

Genevieve Knight

Leanne Johnson

December 1997

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## INQUIRIES

- *For further information about the contents of this Working Paper, please contact the author:*
  **Leanne Johnson** — *telephone:* (02) 6252 5355 *or facsimile:* (02) 6252 8015 *or e-mail:* leanne.johnson@abs.gov.au
- *For information on the* **Working Papers in Econometrics and Applied Statistics**, *please contact the Managing Editor,*
  **Steven Kennedy** — *telephone:* (02) 6252 6617 *or facsimile:* (02) 6252 8015 *or e-mail:* steven.kennedy@abs.gov.au *or write* c/- Analytical Services Section (W42b), Australian Bureau of Statistics, P.O. Box 10, Belconnen, ACT 2616, Australia.
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## TABLES



## GRAPHS

# LIST OF ABBREVIATIONS, ACRONYMS AND OTHER USAGES

| | |
|---|---|
| ABARE | Australian Bureau of Agricultural and Resource Economics |
| ABS | Australian Bureau of Statistics |
| ANA | Australian National Accounts |
| ANZSIC | Australian and New Zealand Standard Industrial Classification |
| APMI | Price Indexes of Articles Produced by the Manufacturing Industry |
| ASIC | Australian Standard Industrial Classification |
| AWE | Average Weekly Earnings |
| billion | thousand million |
| CPI | Consumer Price Index |
| GDP | Gross Domestic Product |
| GDP(I) | Income approach to measuring Gross Domestic Product |
| IOIC | Input-Output Industry Classification |
| MUMI | Price Indexes of Materials Used in the Manufacturing Industry |
| n.e.c. | not elswhere classified |
| PFCE | Private Final Consumption Expenditure |
| PI | Primary Input |
| RSE | Relative Standard Error |
| . . | not applicable |

# ABSTRACT

*Despite the importance of the tradable/non-tradable division to economic theory, there has been little empirical analysis reflecting this division due to a lack of reliable data. This working paper seeks to address the lack of adequate information on the classification, output and prices for the tradable and non-tradable sectors of the Australian economy, using a classification system developed by Dwyer (1992) as a starting point.*

*In most previous analyses, the classification of output as tradable or non-tradable is based upon untested a priori reasoning. The output and price measures developed in this paper have attempted to address the acknowledged weaknesses of previous measures and the adopted methodology is an improvement upon previous methods. The improvements are due to the use of an objective and consistent classification system, the disaggregated level of the analysis, the ability to capture changes in the composition of sectors, the breakdown of the tradable sector into its importable and exportable components, the consideration of the choice of price index formula, and the detailed matching of price data to input-output industry.*

*Several important features have been revealed in Australian data. The size of Australia's tradable sector is significantly smaller than many previous estimates have indicated. The composition of the tradable and non-tradable sectors has changed significantly between 1977–78 and 1989–90, and the importance of the exportable and tradable sectors has increased over the past decade. The relative importance of individual industries within the tradable and non-tradable sectors has also been identified. The development of price indexes for the tradable and non-tradable sectors of the Australian economy has revealed the relative volatility of the prices of tradable (especially exportable) commodities compared to non-tradable commodities, and a significant improvement in Australia's internal competitiveness (as measured by relative domestic prices) since 1980.*

*Valuable information has been obtained about the size, composition and price movements for the tradable and non-tradable sectors in Australia over the period 1977 to 1995. To the extent that the adopted methodology provides an accurate representation of the tradable and non-tradable sectors, the data presented in this paper can be applied to the empirical analysis of a range of topics to which the tradable/non-tradable dichotomy is relevant.*

*Given the importance of this division to modelling the features of a small, open economy such as Australia, the development of this dataset opens up empirical research opportunities which the lack of adequate data had previously served to limit. Consideration is being given to releasing a tradables database, containing the series outlined in this working paper, on a regular basis. However, this is dependent upon sufficient interest being demonstrated in the sectoral profile, output and price index data compiled in this project.*

The authors wish to thank Jacqueline Dwyer, Peter Rossiter, Ken Tallis, Kevin Donovan and Trevor Travers for helpful comments and assistance with this research project.

# 1. INTRODUCTION

The distinction between the *tradable* and *non-tradable* sectors of the Australian economy is particularly relevant to the analysis of international trade, the exchange rate, inflation and resource allocation. It arises in policy discussion, especially in relation to Australia's external imbalance. However, analysts have experienced considerable difficulty in obtaining data along tradable and non-tradable lines and this has acted as a constraint upon their empirical investigation. This working paper seeks to address the problem. It develops price and output measures for the tradable and non-tradable sectors of the Australian economy.

While in principle the difference between *tradable* and *non-tradable* commodities is clear cut, in practice it is not. A domestically produced good or service is defined as tradable if it is actually traded internationally (as are exports) or if it could be traded internationally at some plausible variation in relative prices. This latter category includes domestically produced goods and services which replace imports in the domestic market. The difference between a commodity being *tradable* and it actually being *traded* therefore arises as a result of the profitability of trade.

Empirical work on the division of output and prices data into their tradable and non-tradable components has not kept pace with developments in the theory of international trade. Goldstein and Officer (1979) have shown that the conventional proxies of output and prices data for the tradable and non-tradable sectors are deficient in several important respects. In the Australian empirical literature there has been little detailed analysis of what constitutes the tradable sector. As Dwyer (1992, p. 444) notes:

> While most economic commentators have worked from the premise that Australia is a small open economy with a significantly large traded goods sector, the actual size and composition of this sector is unknown. While the output of various industries may be nominated as traded or non-traded on the basis of an *a priori* belief that it possesses the requisite characteristics of such goods, the actual extent to which this is so is not known. From this it follows that the actual prices of traded and non-traded goods are not known.

In this paper an attempt is made to identify the actual composition of the tradable and non-tradable sectors in Australia, and to develop output and price measures corresponding to these sectors. This paper breaks new ground through the development of a dataset for the Australian economy which contains integrated data at both an industry and sectoral level.

The methodology used in compiling these measures is largely based upon the work of Dwyer (1992) and involves defining industries as tradable or non-tradable based on disaggregated input-output table data. Dwyer's (1992) classification system is a substantial improvement upon the standard practice of subjectively assigning broad industry categories to the tradable and non-tradable sectors. Not only is the method more objective but it can reflect dynamic changes which occur in the composition of the sectors over time. The methodology facilitates analysis at the broad level of tradables and at the more detailed level of *importables* and *exportables*. Further, by working with a highly disaggregated classification, the sizes of these sectors can be estimated more precisely. The observable characteristics of Australian production are also better represented by allowing for the tradable sector to include industries with a substantial degree of export orientation or import substitution, rather than specific industries being unrealistically assumed to be *solely* export or import industries.

A background to the theoretical and empirical literature on the division between the tradable and non-tradable sectors is provided in Section 2. The Dwyer (1992) system for defining tradable output is also introduced in this section. Section 3 discusses the practical issues which arise in classifying industries as tradable or non-tradable based on input-output table data. In Section 4, the output shares and industry composition of the tradable and non-tradable sectors are presented and analysed. Section 5 provides a background to the development of sectoral price indexes, while details of the methodology used to compile these price indexes are contained in Section 6. Section 7 presents the industry and sectoral price indexes, together with derived measures of competitiveness. In Section 8, a proposed tradables database is discussed, while Section 9 draws together the results of this working paper and suggests possible areas for future research.

# 2. BACKGROUND

The distinction between the tradable and non-tradable sectors of the economy is considered of particular importance when modelling the characteristic features of a small, open economy such as Australia. In theory, the tradable/non-tradable dichotomy is seen to have special relevance for '. . . *inter alia*, the effects of devaluation, the purchasing power parity theory of exchange rates, the determination of inflation in open economies and the specification and estimation of international trade flows' (Goldstein & Officer 1979, p. 413). The relevant literature (Goldstein & Officer 1979, p. 413) includes:

> . . . the work of Salter (1959), Swan (1963), Mundell (1971), Dornbusch (1973) and Kravis and Lipsey (1978) on the effects on exchange rate changes; of Balassa (1964), McKinnon (1971), and Officer (1976) on productivity bias in the purchasing power parity theory of exchange rates; of Aukrust (1970), Edgren and others (1969), and Cross and Laidler (1976) on the determination of inflation in open economies; and of Murray and Ginman (1976), Clements (1977), and Goldstein and others (1980) on the estimation of trade flows.

The distinction between internationally tradable and non-tradable goods is particularly relevant to the econometric modelling of a small, open economy such as Australia, and has an important place in Australia's contribution to open economy macro-economics — specifically the 'Australian model' of Salter (1959) and Swan (1960, 1963). In this model, a small, open economy is comprised of traded and non-traded sectors. The relative price of traded and non-traded commodities determines the allocation of resources between the sectors. An increase in the relative price of traded goods indicates the enhanced ability of the traded goods sector to attract resources from elsewhere in the economy and has been said to represent an increase in that sector's 'internal' competitiveness (Dwyer 1987, 1990, 1992).

However, analysts have experienced considerable difficulty in obtaining reasonable data along tradable/non-tradable lines. It is precisely this problem which is addressed in this working paper. The remainder of this section surveys previous Australian studies which have estimated tradable output, focusing on the methods of classifying output as either tradable or non-tradable. The methodology adopted by Dwyer (1992) is given particular attention.

## 2.1 Defining Tradable Output

In attempting to separate output data along tradable/non-tradable lines, the initial issue is how to distinguish between tradable and non-tradable goods and services. Goldstein and Officer (1979, pp. 414–15) consider two general approaches:

- The first approach considers only commodities actually traded and so is reliant upon international trade statistics. 'Specifically, the aggregate 'gross domestic product (GDP) plus imports of goods and services' is divided into goods and services actually traded (exports plus imports, or traded goods) and goods and services absorbed in the domestic economy (non-traded goods).'
- The second approach '. . . considers tradable goods as having a wider scope than commodities actually traded . . .' and takes advantage of the fact that there is a difference between a commodity being tradable and it actually being traded. Here, one might classify as tradable '. . . any good that *either is* internationally traded *or could be* traded *at some plausible range of variation in relative prices* . . .'

To achieve a balanced definition of tradables, Goldstein and Officer (1979, p. 415) '. . . suggest the use of *both* trade flows and market behaviour in identifying tradable and non-tradable commodities or industries.' They argue that these two classifications are not independent, as goods and industries may be lying '. . . on a spectrum between the two, and switching over time from one category to another in response to changes in international comparative advantage.'

Dwyer (1992, p. 444) also considers this issue and refines this classification concept as follows:

> At one end of the spectrum a narrow class of goods can be defined as traded. These are goods which enter into international trade (that is exports and imports) and satisfy the law of one price. At the other end of the spectrum is a broad class of goods which either earn or save foreign exchange (that is exports and import replacements) or, at an appropriate relative price, could do so.

Dwyer concludes that most Australian literature considers the broad end of this spectrum, with tradable goods being defined as exports and import replacements, e.g. Salter (1959).

The characteristics of Australian production may also impinge upon the method of classification. Few goods are produced exclusively for export by Australian industries. Generally some of the production is consumed locally, so export industries are best described according to their degree of export orientation. Similarly, some domestic production substitutes for imports with the degree of import substitution being influenced mainly by relative prices, but also by factor endowments. *This situation requires a judgement regarding the degree of export orientation or import substitution which warrants inclusion of an industry within the tradable goods sector.*

The general practice in making the division between tradable and non-tradable sectors involves utilising the available National Accounts data. Dwyer (1992) recognises that the most popular approach is to sum the value of actual exports and imports, which is then nominated as representative of the traded goods sector. This is a *commodity*-based approach which provides a measure of *traded* output, rather than *tradable* output, in the sense that only goods and services which are actually traded are reflected, not those goods and services which could be traded internationally at some plausible range of variation in relative prices. If the focus is restricted to domestically produced output, as in this paper, this approach would give an estimate of traded output equal to the value of exports.

Another popular technique selects tradable *industries*. For example, Goldstein and Officer (1979) take GDP by industry of origin. Then, using *a priori* judgement, industries are assigned to the tradable and non-tradable sectors. Other studies follow a similar methodology, although the assignment of industries varies across studies due to the inherent subjectivity involved. This is illustrated in table 2.1.

In an Australian study, Shann (1982), in a similar fashion to Goldstein and Officer (1979), defines the tradable sector as comprising the industry divisions of Agriculture, Mining and Manufacturing. These methods of classification are generally considered crude and subjective. The classification is performed at a highly aggregated level which may lead to inaccuracies in measurement. Due to the high level of aggregation in the data '. . . it is difficult to get a clear classification of industries into one sector or the other . . . the result is that some tradable (non-tradable) output and employment will undoubtedly be included in the non-tradable (tradable) sector' (Goldstein & Officer 1979, p. 421). Furthermore, changes within industries or shifts of industries between sectors are masked as the classification does not allow for such variation to be represented. Finally, the inherent characteristics of Australian production, where many firms/industries have only a proportion of production set aside for trade are not represented by these classification methods.

In this paper we are interested in developing an industry-based approach to measuring tradable and non-tradable output, as opposed to a commodity-based approach. Defining the tradable sector of the Australian economy as including all industries with a significant degree of export orientation or import substitution leads to a classification which facilitates analysis of relative prices, productivity and the allocation of resources (labour, investment) between the tradable and non-tradable sectors. Under this methodology, tradable output is equal to the sum of gross product of all industries which are significantly export oriented or import substitutable. This estimate will differ from the sum of the value of actual imports and exports.

**TABLE 2.1 TRADABLE AND NON-TRADABLE INDUSTRIES FOR A SAMPLE OF STUDIES**

| *Study* | *Tradables* | *Non-tradables* |
|---|---|---|
| Goldstein and Officer (1979) | Agriculture<br>Hunting, Forestry and Fishing<br>Mining and Quarrying<br>Manufacturing | Electricity, Gas and Water<br>Construction<br>Wholesale and Retail Trade<br>Transport, Storage and Communication<br>Finance<br>Real Estate<br>Consumer Services<br>Business Services<br>Government |
| | **— Divergence from Goldstein and Officer (1979) —** | |
| Aukrust (1970) | *includes*<br>Shipping (Ocean and Coastal Transport)<br>Air Transport | *includes*<br>Agriculture<br>Sheltered Food Manufacturing |
| Edgren, Faxen and Odhner (1969, 1973) | *includes*<br>Foreign Transport | *includes*<br>Agriculture<br>Sheltered Food Manufacturing |
| Maynard and van Ryckeghem (1975) | *no divergence* | *no divergence* |
| Cross and Laidler (1976) | *excludes* output not purchased by consumers | *excludes* output not purchased by consumers |
| Murray and Ginman (1976) | *no divergence* | *excludes* Government |
| **Australian studies —** | | |
| Shann (1982) | Agriculture<br>Mining<br>Manufacturing | all other industries defined for GDP |
| Treasury (1988) | Agriculture<br>Mining<br>Manufacturing<br>Non-manufacturing Services | all other industries defined for GDP |

*Source*: Goldstein and Officer 1979, p. 426; Dwyer 1990, p. 6.

The method of classification developed by Dwyer (1992) utilises input-output matrix information to assign industries to the tradable and non-tradable sectors at a more disaggregated level. This method reduces the degree of subjectivity, and allows for changes in the composition of the two sectors over time. The size and composition of the tradable and non-tradable sectors of the Australian economy are better reflected. Important characteristics of Australian production are represented by allowing the tradable sector to include industries with a substantial degree of export orientation or import substitution. It is not necessary to assume that all industries are solely exporting, import competing or domestic production industries.

The definition of the tradable sector adopted in this working paper is quite broad and is compatible with the characteristics of Australian production and the definition adopted by Dwyer (1992). The output of an industry is assigned to the tradable sector if the industry has a high degree of export orientation or import substitution. In addition to output which is actually traded internationally (exports), this definition includes output which replaces imports on the domestic market. Imports are also traded goods. However, it is important to note that for the purposes of this study, the focus is on domestic production and its split between the tradable and non-tradable sectors, and so imports do not directly enter the tradable sector.

## 2.2 Classifying Tradable/Non-tradable Industries from Input-Output Data

Dwyer (1992) proposes the following scheme for measuring and classifying the output of the tradable and non-tradable sectors. The procedure is illustrated with reference to the simple input-output matrix in table 2.2 which is comparable to the absorption matrix published by ABS (Cat. no. 5209.0, 1986–87, table 2, pp. 20–37).

The four steps of the Dwyer (1992) method are as follows:

(1) Measure the output of each industry within the economy.

The initial task is to nominate a measure of output. Dwyer (1992) uses GDP measured using the Income approach (GDP(I)) valued at producer prices. This can be derived for each of 109 industries in the ABS input-output tables.

(2) Identify tradable output.

Dwyer defines tradable goods as including exports and import replacements. This allows the identification of 'tradable output' using the data available.

(i) Exports are a category of final demand in every row (column X in table 2.2). Each row corresponds to an industry. This exports measure can be used to obtain an estimate of 'industry export orientation' which is the ratio of exports to total supply. A threshold value needs to be nominated, above which an industry is classified as 'export oriented' and included in the tradable sector.

(ii) The data for imports can be extracted from the input-output matrix at the appropriate row (rows $M^c$ and $M^{nc}$ in table 2.2). Each column corresponds to an industry. This can be used to find a measure of the 'scope for import substitution' as a ratio of competing imports to total usage. It is also necessary to nominate a threshold above which an industry is classified as 'import substitutable' and eligible for inclusion in the tradable sector.

(3) Estimate the size of the tradable sector.

Using the results of steps (1) and (2) the gross product of the individual industries defined as members of the tradable sector can be derived. The total gross product for the tradable sector can be defined and expressed as a share of GDP to form an estimate of the relative size of the tradable sector.

(4) Estimate the size of the non-tradable goods sector.

Industries failing to qualify as 'export oriented' or 'import substitutable' are by definition members of the non-tradable sector. So the non-tradable sector is estimated as the residual share of output after the tradable share is estimated.

Although this process of classification entails subjective judgements in choosing the threshold values, Dwyer (1990, p. 5) counters that 'the consistent application of rules permits a largely objective assessment of what constitutes the traded and non-traded goods sectors.'

TABLE 2.2 EXAMPLE OF A SIMPLE INPUT-OUTPUT MATRIX

| | *1* | *2* | *3* | *4* | *IU* | *X* | *DD* | ***Supply*** |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 50 | 0 | 0 | 50 | 50 | 0 | **100** |
| 2 | 0 | 0 | 5 | 0 | 5 | 50 | 70 | **125** |
| 3 | 0 | 5 | 0 | 5 | 10 | 0 | 30 | **40** |
| 4 | 0 | 20 | 0 | 0 | 20 | 0 | 80 | **100** |
| *TI* | 0 | 75 | 5 | 5 | 85 | 100 | 180 | .. |
| Wages | 50 | 10 | 5 | 95 | .. | .. | .. | .. |
| GOS | 10 | 5 | 0 | 0 | .. | .. | .. | .. |
| Rent | 10 | 10 | 5 | 0 | .. | .. | .. | .. |
| *PI* | 70 | 25 | 10 | 95 | .. | .. | .. | .. |
| $M^{nc}$ | 20 | 15 | 5 | 0 | .. | .. | .. | .. |
| $M^{c}$ | 10 | 10 | 20 | 0 | .. | .. | .. | .. |
| **Total usage** | **100** | **125** | **40** | **100** | .. | .. | .. | .. |

Note:

The supply of output by each industry is shown along the rows; the usage of input by each industry is shown down the columns; IU is intermediate usage; X is exports; DD is domestic demand; TI is intermediate input; GOS is gross operating surplus; PI is primary input; $M^{c}$ is competing imports; $M^{nc}$ is non-competing imports.

Along the rows it is shown that of the total supply from a given industry, a certain amount is supplied as an intermediate good — that is, a good for usage by other industries in the production process. The remainder is supplied as a final good, that is, a good which can be allocated to the various categories of final demand. Down the columns it is shown that of the total usage by a given industry, a certain amount is absorbed as an intermediate input, a certain amount may be imported and the remainder is required as a primary input — that is, usage which can be attributed to the various categories of factor income.

*Source*: Dwyer 1990, p. 3.

Further difficulties arise with the threshold values in practical application of the procedure. For 'threshold values of less than 10% the profile of industries comprising the traded and non-traded goods sectors was unstable with major industries moving into and out of the sectors'. However, 'at threshold values above 10% only a narrow class of industries were eligible for inclusion in the traded goods sector . . . these tended to preclude the possibility of import replacements.' As a result, a 10% threshold is recommended by Dwyer. This issue is analysed further in Section 3, where the classification method is further developed.

## 2.3 Dwyer's Results

The impact of Dwyer's (1992) classification system upon estimates of the output share of tradables can be seen in table 2.3. There are several advantages to applying the outlined classification system.

**TABLE 2.3 SUMMARY OF PREVIOUS STUDIES**

| Study | Tradable sector<br>Industry output as % share of GDP |
|---|---|
| Shann (1982) | 30 |
| Pitchford (1986) | 40 |
| Dwyer (1987) | 10–40 |
| Treasury (1988) | 40 |

| | Year | Tradable | Exportable | Importable |
|---|---|---|---|---|
| Dwyer (1990) | 1974–75 | 25.3 | 13.0 | 12.3 |
| | 1978–79 | 25.0 | 12.2 | 13.7 |
| | 1980–81 | 26.3 | 10.3 | 16.0 |
| | 1982–83 | 23.0 | 8.9 | 14.0 |

*Source*: Dwyer 1990, pp. 6–7.

All previous classifications are static, whereas the dynamic nature of the tradable goods sector is better tracked by the Dwyer (1992) classification. This makes the classification more suitable for econometric study. The variability in size of the tradable sector over time also highlights the inaccuracies that may arise from reliance upon crude proxies. Furthermore, this method allows for price change to influence the size of the tradable sector via changes in the import replacement or export orientation of industries, enhancing the value of the data for analysis.

The Dwyer (1992) classification system is usefully disaggregated compared to previous cruder classification systems. Aggregation of the data generates distortions in measurement. When the output of an entire industry group such as the manufacturing sector is classified as tradable, the size of the tradable sector is overestimated. This is noticeable when compared to the Dwyer classification based on individual industries, where the manufacturing sector is subdivided into 66 industries, of which several are non-tradable.

The tradable and non-tradable sectors are built up from the highly disaggregated level of 109 industries, which could alternatively be reclassified to 28 industry groups and then aggregated to the exportable, importable and non-tradable sectors. The composition of the tradable and non-tradable sectors is identifiable at various levels. The ability to break the tradable sector down into exportables and importables is especially important in light of the evidence in table 2.3 that they exhibit quite different movements over time. More aggregated measures can be convenient for some purposes of analysis — this classification system allows many levels of aggregation.

Under Dwyer's methodology, the entire output of an industry is classified as 'exportable' if a significant proportion of the industry's output is actually exported. As a result, the share of exportables is likely to differ somewhat from the share of exports in domestic production. More importantly, the share of importables in domestic production may differ considerably from the share of imports. The entire output of an industry is classified as 'importable' if a significant proportion of its output replaces imports on the domestic market. As the focus of this study is on domestic production, estimates of the size of the *tradable* sector may differ considerably from estimates of the size of the *traded goods* (imports plus exports) sector.

Dwyer estimates that the tradable sector accounts for about 25% of GDP, with the precise estimate varying over time. This is substantially less than the sectoral share estimate of about 40% obtained by summing the value of imports and exports. It is also less than the estimated 30% share of total output obtained by Shann (1982), through the subjective approach.

In table 2.4 (taken from Dwyer (1990, p. 9)), the composition of the tradable and non-tradable sectors over time is shown. The table illustrates 'secular changes in some key industry groups and cyclical changes in those most sensitive to fluctuations in aggregate demand.' The capacity to capture such changes in the composition of the tradable sector is a considerable improvement upon previous subjective classification systems. It should be possible to obtain better information regarding the impact of tariff changes and alterations to taxation and exchange rate regimes upon the tradable nature of industries.

**TABLE 2.4 COMPOSITION OF THE TRADABLE GOODS SECTOR: ESTIMATES FOR INDUSTRY GROUPS AND SELECTED INDUSTRIES AS A SHARE OF SECTORAL OUTPUT (per cent)**

| | *Share of tradable goods sector* | | | |
|---|---|---|---|---|
| *Industry group* | *1974–75* | *1978–79* | *1980–81* | *1982–83* |
| **Principally exportable** | | | | |
| Agriculture | *17.3* | *17.5* | *15.0* | *11.0* |
| Sheep | 4.1 | 4.1 | 3.4 | 2.2 |
| Cereals | 7.6 | 7.0 | 4.8 | 3.3 |
| Forestry | 1.2 | 1.1 | 1.1 | 1.3 |
| Mining | *11.3* | *10.8* | *10.7* | *12.5* |
| Ferrous | 3.0 | 2.1 | 1.9 | 2.6 |
| Non-ferrous | 5.0 | 4.3 | 4.3 | 4.3 |
| Coal, oil, gas | 7.2 | 7.8 | 8.2 | 9.8 |
| Meat, milk products | 3.3 | 3.2 | 2.9 | 3.4 |
| Food products | 4.6 | 3.6 | 3.7 | 4.2 |
| Basic metals | 6.8 | 6.1 | 6.5 | 4.8 |
| Transport, communications | 21.3 | 20.1 | 21.0 | 26.5 |
| **Principally importable** | | | | |
| Textiles | 1.7 | 1.7 | 1.5 | 1.4 |
| Clothing, footwear | 2.9 | 2.8 | 2.5 | 2.6 |
| Wood products | 0.0 | 3.0 | 3.0 | 0.0 |
| Paper products | 4.9 | 4.7 | 4.6 | 5.3 |
| Chemicals | 3.1 | 3.4 | 3.4 | 3.6 |
| Petroleum products | 0.6 | 3.8 | 6.7 | 7.2 |
| Non-metallic minerals | 2.9 | 2.5 | 2.6 | 0.0 |
| Transport equipment | 6.4 | 5.9 | 5.3 | 6.2 |
| Motor vehicles | 5.6 | 5.8 | 5.1 | 5.4 |
| Machinery | 8.7 | 6.8 | 6.8 | 7.0 |
| Miscellaneous | 3.0 | 3.0 | 2.8 | 3.0 |

*Source*: Dwyer 1990, p. 8.

The most crucial advantage afforded by the Dwyer (1992) classification system is the extent to which it yields an actual representation of the tradable and non-tradable sectors and their variability in size and composition over time. The ability to use the disaggregated information available in the input-output tables is also advantageous, allowing a more detailed profile of the tradable sector and its subsectors. Of course, the accuracy of the estimates is directly related to the accuracy of the underlying data sources.

The Dwyer (1992) classification system follows an approach similar to that used in the sectoral allocation of investment, as illustrated in Kent and Scott (1991). Each industry's output is classified to a sector according to the export or import substituting propensity of its output. The decision rule for the sectoral allocation is based upon the orientation of production, as measured by import penetration and export orientation ratios. Thus industries are defined as tradable according to their propensity to produce tradable output.

However, the Dwyer (1992) approach differs from that of Kent and Scott (1991) in the final allocation of output. Dwyer (1992) nominates a benchmark above which an industry is defined as tradable. All the output of any industry defined as tradable is allocated to the tradable sector. Applying the Kent and Scott (1991) method to sectoral allocation of output involves apportioning only a fraction of a tradable industry's output to the tradable sector. This fraction is equal to the industry's propensity for export substitution or import penetration.

It is generally observed in Australia that few industries produce output solely for foreign markets or to compete with imports on the domestic market. Therefore it seems reasonable to define the export/import orientation of an industry in accordance with the measured propensity. However, the Kent and Scott (1991) method of allocation may introduce an unreasonable degree of volatility into measures of tradable output. We consider the Dwyer (1992) method, where all the output of any industry defined as tradable is allocated to the tradable sector, more theoretically suitable. This is because at an appropriate relative price it is optimal for an industry which is mainly export oriented or import competing to export all its output or to only compete with imports on the domestic market. Thus all of the output of the industry is potentially tradable.

The Kent and Scott (1991) method uses the import penetration ratio as a measure of the extent to which a domestic industry produces import competing goods. If the import penetration ratio for an industry is high the industry will be classified as one which produces import competing goods, even though continued penetration of the domestic market may reflect the fact that domestically produced substitute goods are not readily available.

In Dwyer (1992), the propensity for import replacement is measured as the ratio of *competing* imports to the total supply of the corresponding domestic industry. The disadvantage of the methodology of Kent and Scott (1991) is then overcome, because if domestically produced substitute goods were not available for a particular industry, imports would be classified as complementary rather than competing, and the industry would not be classified as an import replacing industry. If an industry's propensity for import replacement exceeds the threshold of 10%, the entire output of the industry is allocated to the importable sector.

Elements of both these methods are used in the approach adopted in this paper. The Dwyer (1992) method is generally embraced, but in a modified format, and for selected 'problem industries' which do not give satisfactory results from adopting this approach, the Kent and Scott (1991) method of output allocation is used.[1]

[1] The Kent and Scott (1991) approach is adopted for the wholesale industry. Section 3.8 outlines the reasons for deviating from the standard approach with this industry.

# 3. PRACTICAL DEVELOPMENT OF THE TRADABLES DIVISION

In this section the assumptions and practical application of the Dwyer (1992) classification method are examined and either adopted or modified. The major modification involves aligning the measurement of GDP(I) with standard Australian National Accounts (ANA) measures. This modification results in the estimates differing from those of Dwyer (1992) for the same years.

The classification method is used to derive information which is used in the construction of two data series. The first is a series showing the size of the tradables sector over time. The second is a series showing the price of tradable commodities over time. The classification method is assessed with regard to the properties of these two series.

The absorption matrix (ABS Cat. no. 5209.0, table 2) is the primary source of data for the tradables division with some data sourced from table 4 (Reconciliation of Flows at Basic Values and at Purchasers Prices by Commodity Group) of the same publication.

The absorption matrix (use matrix) shows the usage of domestic and imported goods. This matrix provides information disaggregated to the 109 industry level, at basic values (the price received by the producer excluding commodity taxes), with indirect allocation of competing imports and direct allocation of complementary imports. For example, imported raw tobacco (a competing import) is allocated to the industry Other agriculture in the 'competing imports' row, while both local and imported raw tobacco flow into the intermediate inputs of the industry Tobacco products (ABS Cat. no. 5209.0, 1986–87, para. 19b). In contrast, natural rubber (a complementary import) is allocated directly to the complementary imports row of the Rubber products industry into which it is an input. The industry classification used is based upon the Australian Standard Industrial Classification (ASIC). Published input-output industries are generally defined by combining 4-digit ASIC industries in consultation with major users and by reference to cross-country comparison. Most of the data come from ABS economic censuses and surveys, with some derived from taxation data, other administrative by-product data and annual reports.

A full example of the application of the Dwyer (1992) approach, as outlined previously in steps 1–4 (see Section 2.2), is shown in Appendix 1. However, due to problems encountered, the method is slightly modified in order to compile the tradable division for 1986–87 shown. The following discussion of how the modifications arose is closely referenced to Appendix 1 and to the input-output tables for 1986–87.

The procedure shown in the spreadsheet for 1986–87 was then repeated for the years 1989–90, 1983–84, 1982–83, 1981–82, 1980–81, 1979–80, 1978–79, 1977–78 and 1974–75.[2] These are all the years for which input-output tables were compiled using a consistent estimation technique, as '. . . commencing with the 1974–75 tables, a new estimation methodology involving a combination of clerical and mathematical estimation techniques was introduced . . .' (ABS Cat. no. 5209.0, Preface). The new methodology involves estimating the summary aggregates (industry outputs, primary inputs and final demand) from basic data sources and estimating intermediate inputs from the preceding input-output table using the RAS mathematical estimation technique.

## 3.1 Homogeneity, Aggregation and Industry Identification

The classification is carried out at the 109 industry level in order to obtain the maximum advantage from disaggregation. It is possible to classify at the 28 sector level instead. However it is acknowledged that when '. . . aggregated to form . . . 28 sectors, . . . the sectors . . . are not as homogeneous' (ABS Cat. no. 5209.0, 1986–87, para. 8). This should be kept in mind when re-aggregating to the 28 sectoral level for analytical purposes.

[2] The 1992–93 input-output table was not available at the time this research was undertaken.

Homogeneity of industry output is important in classification as it indicates that '. . . there is an identity of industry output and supply of the commodity from domestic production . . .' (ABS Cat. no. 5209.0, 1986–87, para. 11). This means that an industry can be identified as primarily producing the commodity — so that the supplies provided by this industry are the domestic market supply for the commodity. Poor homogeneity is usually a result of secondary production.

Specialisation and coverage ratios measure the homogeneity of industry classifications. The specialisation ratio is the ratio of the production by an industry of commodities primary to it to the total output of the industry. The coverage ratio is the market share held by the industry to which the commodity is primary.

Columns 1, 2 and 2a of Appendix 1 show the industry classification at the 109 and 28 industry levels. Homogeneity at the 109 industry level, as reflected by the specialisation and coverage ratios, generally lies between 85% and 100%, with the majority of industries achieving levels above 90%. The minimum value of these ratios accepted in adoption of an ASIC class is 70%, so it can be seen that the 109 industry classification is highly suitable. For the purposes of some analysis, greater aggregation is more convenient. In such cases, the aggregative property of the Dwyer (1992) classification may be invoked keeping in mind the general drawback of a decrease in industry homogeneity.

A high degree of homogeneity means that the total supply estimate for the industry given in the input-output tables is reasonably accurate. For the purposes of the import substitution ratios and the tradables division, homogeneity is highly relevant. If an industry is homogenous, the import substitution ratios accurately represent estimates of the ratio of competing imports to total domestic supply of a good. The import substitution ratio is used as a measure of the portion of total domestic production which could substitute for imports, given suitable price movements. Poor homogeneity may result in total domestic supply for the good being underestimated, and the import substitution ratio for the industry being overestimated. This would result in industries passing the threshold and being incorrectly classified as tradable. The size of the tradable sector would be overestimated. A similar argument can be made relating to export orientation ratios.

The basis for disaggregating to the 109 industry level in deriving the tradable measures lies with the advantages afforded by close industry identification. At this level of disaggregation industries are highly homogenous and enable more precise estimates of tradable and non-tradable output.

## 3.2 Measuring Output

In Step 1 of Dwyer's methodology, which is outlined in Section 2.2, GDP(I) at producer prices was selected as the preferred measure of output. The suitability of this measure is examined in this section.

The output of industries is defined, generally and in the input-output tables, as the production of goods and services for use as inputs into industries or into final demand. Production is the process whereby labour, natural resources, accumulated capital assets and knowledge are applied to the provision of goods and services. It is appropriate that a measure of the size of the tradable sector be gauged using a measure of production as, generally, in analysis related to tradables '. . . one is concerned with production consequences . . .' (Kravis & Lipsey 1978, p. 202).

In attempting to measure the tradable sector, we consider it appropriate that the output measure be taken from the domestic perspective. This is because most investigations would use the estimates to examine domestic issues — for example, redistribution of industry output towards exportable goods. Therefore a measure of Australian domestic production is needed. Alternative measures might include Gross National Turnover, which adds in the value of overseas production used in Australia (that is, imports). Such output measures do not provide a clear picture of Australian output.

There are several measures of domestic output. In measuring the value of economic production in Australia in a given period, care must be taken to avoid double-counting, for '. . . if the value of all goods and services produced were added together there would be serious duplication, because some goods and services would be added in several times at successive stages of production . . .' (ABS Cat. no. 5216.0, 1990, para. 2.15). This desired characteristic reduces the choice of output measures. GDP is an accepted measure of economic production which is free of duplication. To avoid duplication, intermediate purchases are deducted from calculations. In a GDP measure, it is only the value added in production which is important. GDP is defined as '. . . the total market value of goods and services produced in Australia after deducting the cost of goods and services used up in the process of production (intermediate consumption) but before deducting consumption of fixed capital . . .' (ABS Cat. no. 5216.0, 1990, para. 2.15). It is worth noting that GDP is valued at market prices and that it is the value added in production within the domestic territory of Australia, regardless of whether the factors of production are Australian or non-resident.

There are three possible approaches to measuring GDP; the income, production and expenditure approaches. Using the income approach, GDP(I) can be measured by summing the incomes generated by domestic production. It consists of the compensation of employees (wages, salaries and supplements), provision for the consumption of fixed capital (depreciation), net operating surplus and net indirect taxes. Under the income approach a measure of gross product (consistent with GDP(I)) can be obtained from the input-output tables for each of the 109 input-output industries. Therefore, the income approach to measuring GDP is adopted in this paper.

In table 2.2, the Primary Input (PI) row shows the sum of factor shares for each industry, thus showing gross product by industry. Summing across the row gives a GDP measure. In the absorption matrix (ABS Cat. no. 5209.0, table 2) there is no row which is analogous to row PI. The rows designated by the prefix 'P' between T1 (Intermediate Usage) and T3 (Total Usage) show the primary inputs which have been purchased by industries. By applying the available reconciliation information a measure of GDP(I) comparable with the ANA figure for GDP(I) can be compiled from the input-output tables (ABS Cat. no. 5209.0, 1986–87, Appendix E, p. 88). An input-output based measure of GDP(I) can be obtained as follows :

GDP(I) = P1 (Wages, Salaries and Supplements) + P2 (Gross Operating Surplus)[3]
+ P4 (Indirect Taxes n.e.c. net) + P7A and P7B (Duty on Imports)
+ a measure of commodity taxes net of subsidies.[4]

An important issue which arises regarding the measure of net commodity taxes is the point of valuation. Valuation may be according to basic values, producers' prices or purchasers' prices. The valuation convention generally adopted when measuring GDP is the producers' price. Alternatively GDP may be measured at 'factor cost', which excludes taxes and subsidies.

When transactions are valued at basic values, commodity flows are recorded at the value at which they leave the producers before commodity taxes are charged. When transactions are valued at producers' prices or purchasers' prices, commodity taxes are recorded as being paid by producers. Thus, the producers' price value of a good is the basic value plus commodity taxes less subsidies. The purchasers' price value of a good is equal to the producers' price value plus the relevant margin elements of transport and storage, insurance and wholesale and retail marketing costs.

The absorption matrix data being used to derive the data are recorded at basic values, with the commodity taxes being recorded as paid by the purchasers of the commodities. As a result it is incorrect to use the data in row P3 (Commodity Taxes net) to measure GDP(I). The data in this row provide a measure of commodity taxes paid on inputs into the industry or final demand category, while a measure of commodity taxes on the output of each industry is required to measure industry gross product.

[3] Gross Operating Surplus = Net Operating Surplus + Depreciation.

[4] An adjustment also has to be made for net indirect taxes on the transfer of real estate.

There are no input-output tables compiled at producers' prices, and other sources would not have the data at the required industry level. However in tables valued at purchasers' prices, commodity taxes are shown as paid by producers. It is then a small task to derive the measure of net commodity taxes from table 4 of the input-output tables which shows a summary reconciliation between the flows at basic values and at purchasers' prices. The data in this table are compatible because competing imports are allocated indirectly resulting in the flows being the same as in table 2. In table 4, the second column in set T6 (Total Supply) shows the 'net commodity taxes' associated with the respective 'basic values' by industry, as paid by the producer. It is these data which are used as the measure of commodity taxes net of subsidies in calculating an input-output based measure of GDP(I).

The definition of industry gross product is related to the definition of aggregate GDP(I) provided above, although there are some notable differences. The items P7A and P7B, duties on competing and complementary imports respectively, appear in the definition of aggregate GDP(I) but not in the definition of industry gross product. Duties on imports are not part of the gross product of domestic industries which produce similar products. An additional unpublished series 'net commodity taxes on competing imports' which does not enter into the definition of aggregate GDP(I) also needs to be deducted to obtain the best estimate of industry gross product. The estimate of industry gross product for each of the 109 input-output industries is obtained as follows:

industry gross product = {P1 + P2 + P4} table 2 + T6 (column 2) table 4
− net commodity taxes on competing imports

The input-output based measure of GDP(I) can be obtained by summing industry gross product over the 109 industries and then making adjustments for net indirect taxes on transfer of real estate, duties on imports and net commodity taxes on competing imports. It is important to note that the estimate of total GDP(I) derived from the input-output tables is not exactly equal to the estimate of GDP(I) shown in the ANA. However the difference is usually minor, estimated as '0.2% lower than the estimate in . . . 5204.0' (ABS Cat. no. 5209.0, para. 114). The difference is attributed to the different sources of data for P1, P4 and P7, the different definitional treatment of the imputed bank service charge and the non-adoption of Australian Accounting Standard 17 in the economic censuses used as a data source for estimates of P2 in the input-output tables.

Comparison of the input-output based industry gross product estimates with the ANA industry estimates shows some significant differences for particular industries. Again these differences are partly due to different data sources and methodology, and the treatment of the imputed bank service charge. In addition, the treatment of secondary production and of sales tax lead to differences between the estimates at the industry level. Regardless of these differences, the input-output based estimates of gross product for the 109 industries are the only estimates available at this level of disaggregation.

The measures built up in this section provide estimates of gross product by industry at the Input-Output Industry Classification (IOIC) 109 industry level. With this in mind, note should be taken of the caution that '. . . since indirect taxes and subsidies affect the measurement of the gross product of some industries more than others, comparisons between industries are usually made at factor cost . . .' (ABS Cat. no. 5216.0, 1990, para. 2.16).

Given the ability of the data to provide both a measure of 'Industry gross product at factor cost' (=P1+P2) and 'Industry gross product at producers' prices' (= P1+P2+P4+T6 − net commodity taxes on competing imports), both of these measures are calculated. GDP at factor cost is the income which accrues to the owners of the factors of production and is equivalent to GDP less indirect taxes plus subsidies. 'Industry gross product at factor cost' estimates are shown in column 8 of Appendix 1 and column 9 shows the estimates of industry gross product at producers' prices. The individual elements of the formulae for GDP(I) are not reproduced in Appendix 1 but can be extracted from the input-output tables for 1986–87.

## 3.3 Identification of the Tradable Nature of Output

In this section, discussion relates to the procedure for implementing steps 2 and 3 of Dwyer's methodology. An example of this procedure for the year 1986–87 is provided in Appendix 1.

The exportable nature of an industry's output (the degree to which it is 'export oriented'), is identified according to the procedure outlined in step 2 (i). Column 11 of Appendix 1 records exports for all 109 industries, while column 12 shows the total supply of each industry. Column 13 gives the resulting *degree of export orientation, which is calculated as the percentage of an industry's total supply accounted for by exports.*

The importable nature of an industry's output (the degree to which it is 'import substitutable'), is identified according to the procedure outlined in step 2 (ii). Column 3 records competing imports for each industry, while column 4 shows total usage. The *degree of import substitution* for each of the 109 industries is shown in column 5a. *It is calculated as the percentage of total usage accounted for by competing imports.*[5]

The importable, exportable and tradable sectors are identified and quantified according to the procedure outlined in step 3. Columns 6 and 14 show the operation of the decision rule for an industry's inclusion in the importable or exportable sector respectively. Each industry denoted by an 'x' in column 6 is classified to the importable sector for the year 1986–87. The decision rule is that if the degree of import substitution or export orientation (when rounded) for an industry is greater than or equal to the threshold value of 10% then the relevant industry is eligible for inclusion in the importable or exportable sector respectively. A specific modification to this decision rule, relating to complementary imports, is outlined in the following section. If an industry is not eligible for inclusion in the importable or exportable sector, it is classified as non-tradable in accordance with step 4 of Dwyer's methodology.

Where an industry is eligible for inclusion in both the importable and exportable sectors, it is denoted by 'xx' in both columns 6 and 14 of Appendix 1. In these cases, the industry's gross product is apportioned between the importable and exportable sectors according to the following factors:

for exports: $X\% / (X\% + M\%)$
for imports: $M\% / (X\% + M\%)$

where: X% is the degree of export orientation
M% is the scope for import substitution

These factors are shown in columns 7 and 15 of Appendix 1 for importables and exportables respectively.

As outlined in Section 3.2, deriving an input-output based measure of GDP involves making several adjustments to the sum of industry gross product across all 109 industries. As there is no clear cut way of allocating the adjustments between sectors, an estimate of sectoral gross product is calculated as the sum of the gross products of all industries which form part of the sector. To ensure that the sectoral shares sum to unity[6] it is necessary to abstract from these adjustments and use the sum of industry gross products as an estimate of GDP.

An estimate of gross product for the non-tradable sector is calculated by summing the industry gross product of all industries allocated to the non-tradable sector. The same procedure is applied to calculate sectoral gross product for the exportable and importable sectors, except for the modification outlined above which is applicable when an industry is allocated to both the importable and exportable sectors. Tradable gross product is calculated as the sum of importable and exportable gross product. The summation of the industry gross product for each sector is shown in the row 'Total' beneath the relevant columns in Appendix 1.

Gross product at producer prices for the importable, exportable and non-tradable sectors is shown at the bottom of columns 10a, 16a and 17a respectively, while gross product at factor cost for each of the sectors is shown at the bottom of columns 10, 16 and 17 respectively. Tradable

[5] A modification to this methodology is outlined in Section 3.4.

[6] Also to ensure the industry weights used to compile sectoral price indexes sum to unity.

gross product valued at producer prices is shown at the bottom of column 16a in the row titled 'tradable output', while tradable gross product at factor cost is in the same row at the bottom of column 16. In the row 'total GDP' at columns 16 and 16a the sum of gross product for all 109 input-output industries is shown. Several adjustments would need to be made to this figure to obtain the input-output based measure of GDP(I). The gross product for each of the sectors is expressed as a share of 'total GDP' in the row entitled 'share of GDP'.

In the course of the compilation of estimates of the size of the tradables sector several issues arose which concerned the practical implementation of the Dwyer (1992) method. Several modifications were made to this method, and one of the key modifications is outlined in the following section.

## 3.4 Complementary Imports in the Classification

The first issue to be broached is the question of how complementary imports should be treated in the tradables/non-tradables classification. This issue has not been examined in previous work. Section 2.1 noted that the *broad* definition of tradables is most applicable to the Australian situation. This definition includes import replacements which are sold on the domestic market as well as goods which are actually traded internationally.

Imports are separated into two divisions in the input-output tables: complementary and competing imports. Complementary imports are not produced locally. These represent an important part of traded goods, and so enter into a broad measure of tradable output. Competing imports are relevant to import replacements. They are goods for which there is similar domestic production. As such, they are important to a broad definition of tradable output as they enable identification of possible import replacements and are representative of the scope for import substitution.

Since this is a binary classification, complementary imports must be either tradable or non-tradable. According to the broad definition of tradables outlined in Goldstein and Officer (1979, p. 415), a tradable good is '. . . any good that *either is* internationally traded *or could be* traded at some plausible variation in relative prices . . .' Complementary imports, forming a part of international trade, are thus defined as tradable.

Complementary imports do quite often form a sizeable amount of international trade — for example the value of complementary imports in 1986–87 is $2.07 billion. To exclude them from a measure which attempts to identify tradable output is to ignore an important contribution.

The distinction between internationally tradable and non-tradable goods lies at the heart of the theory of international trade. As such, the tradable division adopted should take into account the variety of uses to which it might be applied, and thus allow for the most suitable tradable classification possible. Although the international trade literature is very extensive, a cursory study shows that the issue of whether imported products are net substitutes or net complements for non-tradable products is often crucial to the analysis. This is exemplified by the following extract (Woodland 1987, p. 665):

> . . . take the case of an increase in the international price for a nation's import good. If there are just two traded products, a single consumer and . . . a third product that is consumed but not traded . . . the rise in the price of the imported product causes imports to change directly, and indirectly via the consequent change in the price of the non-tradable product. The total effect consists of a substitution effect and an income effect. The substitution effect is to reduce imports. The direct effect of the reduced real income is to reduce imports, while the indirect effect causes the quantity demanded and hence the price of the non-tradable product to fall (ruling out inferiority). *This fall in price causes a reduction in the outputs of both the imported and non-tradable goods if they are net complements* . . . thus arises the paradoxical case where an increase in the price of the imported product causes the level of imports to rise . . . if there is a fixed demand for the non-tradable product the indirect income effect vanishes and so the quantity of imports falls in response to a rise in their price . . . *one can ensure this result by assuming that the non-tradable and imported products are net substitutes.*

It can be seen from this that it is important that both complementary imports and competing imports are accounted for within tradables in the classification adopted. In this way, the true characteristics of the data are revealed in a measure of tradables, and not ruled out through a prior assumption in the classification structure.

Apart from these theoretical considerations, there are significant statistical measurement problems in the complementary imports division which warrant the inclusion of complementary imports in tradables. The definition of complementary imports in international trade theory is based around the concept of imported products which are not domestically produced. The division of imports into complementary and competing is performed by the ABS in forming the input-output tables and does not always follow this basis. The division is based upon a classification which is not static over time, depends upon the value of the imports c.i.f. (i.e. including cost, insurance and freight) and includes 'non-classifiable commodities'. The following quote from ABS Cat. no. 5209.0 (1986–87, para. 23) outlines the adopted approach:

> In principle, complementary imports are those commodities which are not produced in Australia (eg. natural rubber). All imports for which insufficient information is available to enable them to be classified to an industry-of-origin specific IOCC item are treated as complementary in these tables. Also, imports which are complementary in principle and which are identified as having a value of less than $1m at the AICC item level are not treated as complementary.[7]

It can be seen that, in practice, the complementary imports classification does not adhere to the principle of the theoretical definition. The complementary import classification used for the input-output tables has not remained static over time. Over the time period used for the study (1974–75 to 1989–90) a number of changes have been made to the category of complementary imports. This is illustrated in table 3.1. The current classification differs from that of 1974–75. 'In the 1974–75 edition of the classification, all imports for which no Australian production was recorded were treated, in principle, as complementary imports regardless of size' (ABS Cat. no. 5209.0, 1977–78, p. 334). This is in accordance with the theoretical definition of complementary imports.

**TABLE 3.1 NUMBER OF IMPORT GOODS CLASSIFIED AS COMPLEMENTARY IMPORTS(a) WITH A VALUE OF $1M OR MORE**

| Year | *Complementary import classes* | *Total value c.i.f. ($ million)* |
|---|---|---|
| 1974–75 | 29 | 1 128.9 |
| 1977–78 | 16 | 1 246.6 |
| 1978–79 | 16 | 1 318.0 |
| 1979–80 | 16 | 1 440.7 |
| 1980–81 | 16 | 1 407.8 |
| 1981–82 | 16 | 1 365.2 |
| 1982–83 | 16 | 1 599.4 |
| 1983–84 | 28 | 2 028.2 |
| 1986–87 | 28 | 2 069.6 |
| 1989–90 | 16 | 2 174.9 |

(a) A change in the classification system used in Appendix D of ABS Cat. no. 5209.0 means that the number for 1989–90 is not strictly comparable to previous years.

[7] AICC refers to the Australian Import Commodity Classification. This corresponds to an IOCC (Input-Output Commodity Classification) value of $10 million.

Not only has the input-output definition of complementary imports changed, but the current process of excluding relevant imports of value less than $1 million from the complementary imports category has important implications too. It means that the components of this category enter and leave according to variations in price and volume, a discrimination procedure unrelated to the principle of the complementary imports definition. The number of non-classifiable goods included within the definition of complementary imports has also changed over time.

The scope of these variations can be seen by examining Appendix D to the input-output tables. This Appendix identifies which imports are classified as complementary, and includes non-classifiable imports. The changes to this table over time indicate the extent of variation in the classification of complementary imports. It is from this source that table 3.1 was derived.

The measure of GDP(I) at producer prices incorporates complementary import duty (P7a). If the GDP(I) measure is used to gauge the size of the tradable sector, and if complementary imports are categorically excluded from tradables, then a distorted measure of the contributions to GDP(I) at producer prices will result.

After consideration of these points, it was concluded that complementary imports should be measured within step 2(ii) of the classification method. The main reason for this decision is the incompatibility of the practical definition of complementary imports in the input-output tables with the theoretical definition, and particularly the variation in the practical definition over time.

To make this adjustment to the methodology, the complementary imports data can be extracted from the absorption matrix within step 2(ii) and treated in a similar fashion to competing imports. Complementary imports can be found in column 3a of Appendix 1. Note that, unlike competing imports (which are allocated indirectly to a domestic industry which produces similar goods), complementary imports are always allocated directly to the domestic industry into which they are an input. To find a measure of the 'degree of complementary import usage' a ratio of complementary imports to total usage is formed (see column 5).

The 'degree of complementary import usage' differs from the 'import substitution degree'. It is not a measure of the domestic production which, with advantageous price movements, might replace imports and also be exported, as the 'import substitution degree' is. However, due to problems with the complementary imports category in the input-output tables, it does represent such a measure for non-classifiable and mis-classified components. Additionally, it provides a measure allowing for any combination of the effects on production over time of sustained price movements, innovation, technological change, change in production technique, etc. These might result in modification of the proportion of complementary imports used in production, perhaps due to substitution with a newly developed domestic good or a competing import. This would be borne out in movements of the degree of complementary import usage.

In column 5b of Appendix 1 the *import penetration ratio* is calculated as the sum of the degrees of import substitution and complementary import usage. The *new decision rule* for inclusion in the importable and tradable sectors is that industries with *a degree of import penetration* which is greater than the threshold are eligible for inclusion.

Note that at no stage does the degree of complementary import usage for an industry exceed the threshold of 10%. For most industries complementary import usage is negligible. However, due to possible mis-classifications and the inconsistent definition of complementary imports over time it is important that complementary imports not be excluded from the analysis. For select industries, the degree of complementary import usage may be significant enough to push the import ratio above the threshold. These can then be recognised as 'moving industries' and examined on a case-by-case basis.

## 3.5 Changes to the Industry Classification

It is important to note that the IOIC changes over time. There have been definitional changes to both the ASIC and the IOIC, due to updates and the implementation of new versions of the ASIC. This can be quite relevant when considering the pattern of movements of industries into and out of the tradable sector, as these movements may be related to such changes in the IOIC rather than true variation in the tradable industry profile. Over the period studied (1974–75 to 1989–90), these changes appear to have had some effect on the measures derived from the input-output tables. The extent of this impact is investigated further in this section.

The ASIC has changed twice, with three different versions of ASIC used to define the input-output classification over the period 1974–75 to 1989–90. The 1974–75 tables were based on ASIC 1969; 1977–78, 1978–79, 1979–80, 1980–81 used ASIC 1978; 1981–82 and onwards used ASIC 1983.

The changeover from ASIC 1969 to ASIC 1978 is reconciled in the 1977–78 input-output tables (ABS Cat. no. 5209.0) in Appendix D, where the seven IOIC industries said to be most affected are listed. In addition the redefinition of the ASIC classes which occurred in this ASIC changeover is broadly aligned in a key between the 1969 and 1978 versions of ASIC (ABS Cat. no. 1209.0).

Numerous changes to ASIC were implemented, involving the introduction of new industry classes, new codes for ASIC classes, revisions to class definitions, transferring primary activities between classes, and deleting or adding new primary activities to class definitions. The composition of many classes underwent change. The difficulty which such a change introduces, is that the classification is impure over time. Linking a 1969 class to a 1978 class which is ostensibly identical in name can be problematic as the definition of that industry class may have been altered. The ASIC and IOIC classes may concord but there may still be compositional differences which cannot be aligned. This can affect measures of total supply, imports and exports such that movements in the measures derived from the input-output tables for 1974–75 and 1977–78 cannot be distinguished in analysis as due to economic movements.

ASIC changes will impact upon the quality of the measures derived for this analysis mainly when the ASIC redefinition crosses the IOIC class boundaries. Investigation shows that this effect is widely evident in the changeover from ASIC 1969 to ASIC 1978.

Due to these problems, there are reservations held as to the validity of linking values drawn from the 1974–75 input-output tables to those drawn from later tables. Excluding the 1974–75 tables would effectively result in the loss of three years information. Whether or not to retain 1974–75 tables in this analysis rests on the desired quality of the series to be formed.

In 1974–75 there were 29 and 109 IOIC industries at the two commonly used levels of aggregation, due to the inclusion of the dummy industry Business expenses (99.01). This dummy industry '. . . served as a convenient vehicle for recording commodity flows, many of which were very small and about which reliable data were limited. The business services row recorded inputs of such commodities into industries and the . . . column recorded production of such inputs' (ABS Cat. no. 5209.0, 1977–78, para. 126). This dummy industry has no counterpart in ASIC 1978. In later years, such items are allocated directly to the using industries in the input-output tables. For the input-output tables for 1977–78 to 1982–83 there are 28 and 108 industries as this dummy industry is deleted.

Changes to ASIC between 1974–75 and 1977–78 in turn caused four code and nomenclature changes to the IOIC, which can also be seen in the reconciliation provided in Appendix D to the 1977–78 input-output tables. These can have an effect on the profile of the tradable sector, as can changes to ASIC.

It would appear that little change to the classification occurred during the changeover to ASIC 1983. 'The 1983 edition of ASIC incorporates a completely revised set of transport and storage industries but is in most other respects identical with the 1978 edition of the ASIC' (ABS Cat. no. 1201.0, vol. 1, para. 96).

The revisions to the transport and storage industries in ASIC 1983 resulted in a redistribution of some of the ASIC members of the IOIC industries. The service-related components are removed from the IOIC industries 52.01, 53.01 and 54.01 and grouped together under the new IOIC industry Services to transport (57.01). The Communication industry varies its code in the IOIC and ASIC but remains otherwise unchanged. The industry is coded as IOIC 55.01 for 1974–75; 56.01 for 1977–78 to 1982–83; 59.01 for 1983–84 onwards. There are 28 and 109 industries from 1983–84 onwards.

The problem of changes to classifications will impact on the application of the information derived from the input-output tables. However it can be resolved in several ways. For the time series measuring the size of the tradables sector, the simplest solution is to curtail the series so that it begins in 1977–78. However, with regard to the weights derived for the tradables price index, the regime for 1974–75 is fixed equal to those of 1977–78, but the GDP data from the 1974–75 tables are applied to this fixed sectoral profile.

The Australian and New Zealand Standard Industrial Classification (ANZSIC) has replaced ASIC 1983 in the compilation of the 1992–93 input-output tables, and the number of IOIC industries has increased to 113. The implications for the identification of the tradable sector will need to be addressed if the latest input-output data are to be incorporated into the analysis.

## 3.6 The Tradables Decision Rule

An issue arises concerning the decision rule by which membership of the tradable sector is judged. An industry is defined to be tradable if its degree of export orientation or import penetration is at least 10%. The threshold is initially set at 10%, however the level of analysis is carried out to two decimal places generally. A decision must be made as to when 10% occurs, as quite regularly the degree of import penetration or export orientation is measured as 9.79% etc. The general application of a mathematical rounding technique was considered the simplest, most consistent and unbiased method of applying the decision rule. Specifically, any number within the range 9.50–10.49 (inclusive) is rounded to 10%. This rounds numbers so that 9.50% (two decimal places) is the cut-off point for the 10% (zero decimal places) decision rule, where the general decision rule is precisely stated as 'if the observed industry percentage is greater than or equal to 10%, then it is considered to be importable / exportable, otherwise it is not.' Consistently applied, this is an objective method. This rule is considered appropriate given the realistic level of reliability for the estimates.

## 3.7 Sensitivity of the Threshold for the Decision Rule

The threshold for the decision rule has been set at 10%. The issue of the sensitivity of the classification to small changes in the threshold level is now analysed. This is an important issue, as the threshold decides the limit to the size of the tradable sector, by judging what industries can be identified as tradable. There are several criteria which should be considered for judging the desired threshold level.

The threshold should be chosen to reflect the orientation of domestic production for an industry. This should be carried out such that the threshold indicates a share of production for import substitutes and exports, beyond which it is likely for the industry that international markets exert a discernible influence on the behaviour of the industry.

It is also important that the threshold chosen should retain the advantages of the Dwyer classification system which are outlined in Section 2. The most important of these is the ability to reflect changes in the size of the tradable sector due to the impact of the business cycle on production. This requires that the threshold not be set too low or too high, as the stability of the sector, induced by the level of the threshold, would then mask any movements in the tradables generated by the business cycle. However, the threshold should also be such that the industry composition of the sectors is not too unstable. Too much instability in the tradable industry profile would cause problems in the applications of the tradables estimates. For example, if the tradable sector's constituent industries identified by the threshold were subject to high variability, then this would impact on the regimen of a tradables price index.

These criteria require qualitative assessment, which can be subjective. It is important to gain a substantially objective viewpoint and better understand the quantitative aspects of the threshold judgement. To do this, the sensitivity of the data to the threshold level was examined by numerical inspection of the data characteristics.

At a 10% threshold, there are several industries which move in and out of the tradable sector over the time period, which will be referred to as moving industries. It is relevant to analyse these to gain information about the stability of the 10% threshold level, with regard to the industry profile.

A total of 27 industries are separately identified as moving industries in importables and exportables[8]. Note that the 1974–75 tables are not included in this analysis due to the classification changes discussed in Section 3.5. The sectoral profile for 1974–75 is assumed equal to that of 1977–78. If the 1974–75 tables were included in this analysis the number of moving industries would increase. For example, the industries 5301 (water transport) and 5401 (air transport) were affected by the restructure of the complementary imports classification after 1974–75.

In exportables, the industry 5701 (services to transport) is only introduced in the 1983–84 restructure of the IOIC and is immediately identified as a significant exportable. This industry should not be described as a moving industry because the effect is due to a change in classification and not the threshold. The total number of moving industries falls further to 24 because industries 1400 (minerals n.e.c.) and 2901 (basic iron and steel) are double-counted, being moving industries for both importables and exportables.

Stability is defined according to the constancy of industry classification over time. Poor stability is defined as being when an industry repeatedly moves between sectors over time. After making the adjustments outlined above there are 12 moving industries in the exportable sector and 14 in the importable sector, with two moving industries being common to both. These remaining moving industries are detailed in table 3.2. This might appear to suggest that the importable sector is marginally less stable. However, when these figures are presented as a proportion of the total number of industries identified as exportable or importable — 12 of 28 (43%) and 14 of 54 (26%) respectively — then it can be seen that it is exportables which present a less stable profile. It is important to find out whether this variation is due to the threshold level or other factors such as the business cycle.

Table 3.2 can be used to analyse the industries identified as moving industries by examining the degree of import penetration or export orientation measured over the entire time period for each moving industry. The table gives an insight into the stability and direction of movement of the measured importable and exportable percentages for each industry over time.

The dramatic change in the exportable nature of the Sheet metal products industry (3102) is due to a change in classification which led to coins being included in this industry for the first time in the 1989–90 input-output tables. The importable nature of the Ships and boats industry (3202) is highly volatile. The importable nature of the Coal, oil and gas industry (1200) has declined over the past decade and there has been a corresponding increase in the exportable nature of this industry, which contributes a significant share of total gross product.

The movement of an industry into or out of the tradable sector may be due to a long-term trend in the import penetration or export orientation ratios. The Manufacturing n.e.c., Wool scouring and Non-metallic mineral products industries are examples. Other industries move into and out of the tradable sector over time. This may be due to the effect of the business cycle on international trade. In general the movement of an industry between sectors is consistent with its overall behaviour. Some of the volatility can be attributed to measurement error but much can be explained by the inherent volatility of international trade.

[8] Based on the published input-output tables, initially industry 49.02 (repairs n.e.c.) was allocated to the importable sector in 1983–84, making it a moving industry. Advice was received that the unusually high value of competing imports published for 1983–84 and 1986–87 was likely to be an error. On this advice the industry was allocated to the non-tradable sector for 1983–84 and so remains in the non-tradable sector over the entire period considered.

TABLE 3.2 MOVING INDUSTRIES

| | | *1977 -78* | *1978 -79* | *1979 -80* | *1980 -81* | *1981 -82* | *1982 -83* | *1983 -84* | *1986 -87* | *1989 -90* |
|---|---|---|---|---|---|---|---|---|---|---|
| | | DEGREE OF EXPORT ORIENTATION (%) | | | | | | | | |
| **Exportable industries** | | | | | | | | | | |
| 1400 | Minerals n.e.c. | 9 | 13 | 9 | 8 | 7 | 8 | 10 | 19 | 22 |
| 2103 | Fruit & vegetable prod. | 8 | 8 | 9 | 9 | 7 | 7 | 5 | 10 | 7 |
| 2501 | Sawmill products | 9 | 9 | 12 | 12 | 10 | 11 | 12 | 15 | 13 |
| 2901 | Basic iron and steel | 13 | 14 | 11 | 9 | 7 | 9 | 7 | 8 | 12 |
| 3102 | Sheet metal products | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 7 | 20 |
| 3204 | Aircraft | 7 | 6 | 10 | 8 | 8 | 5 | 8 | 6 | 6 |
| 3301 | Photo & scientific equip. | 8 | 8 | 10 | 10 | 10 | 12 | 11 | 11 | 8 |
| 3305 | Agricultural machinery | 5 | 6 | 5 | 7 | 5 | 6 | 5 | 10 | 7 |
| 3401 | Leather products | 10 | 13 | 13 | 8 | 9 | 10 | 10 | 10 | 11 |
| 3405 | Manufacturing n.e.c. | 6 | 6 | 7 | 8 | 8 | 7 | 9 | 10 | 10 |
| 4701 | Wholesale trade | 8 | 9 | 12 | 10 | 9 | 9 | 9 | 10 | 10 |
| 6103 | Investment | 15 | 18 | 5 | 5 | 8 | 7 | 4 | 3 | 4 |
| | | DEGREE OF IMPORT PENETRATION (%) | | | | | | | | |
| **Importable industries** | | | | | | | | | | |
| 0106 | Agriculture n.e.c. | 7 | 6 | 6 | 6 | 6 | 7 | 7 | 10 | 7 |
| 0400 | Fishing and hunting | 14 | 6 | 6 | 8 | 7 | 10 | 9 | 12 | 7 |
| 1200 | Coal, oil and gas | 26 | 23 | 31 | 31 | 30 | 26 | 17 | 7 | 5 |
| 1400 | Minerals n.e.c. | 19 | 13 | 14 | 17 | 14 | 11 | 9 | 10 | 13 |
| 2108 | Food products n.e.c. | 13 | 12 | 12 | 9 | 11 | 11 | 12 | 14 | 13 |
| 2301 | Wool scouring | 12 | 9 | 8 | 6 | 6 | 5 | 6 | 5 | 5 |
| 2504 | Furniture | 7 | 8 | 8 | 8 | 9 | 7 | 10 | 11 | 13 |
| 2603 | Paper products n.e.c. | 14 | 14 | 13 | 11 | 12 | 9 | 12 | 12 | 16 |
| 2705 | Soaps and detergents | 6 | 7 | 7 | 8 | 8 | 7 | 8 | 8 | 11 |
| 2706 | Cosmetics | 7 | 10 | 11 | 10 | 10 | 10 | 11 | 17 | 22 |
| 2806 | Non-metal mineral prod. | 8 | 9 | 9 | 9 | 9 | 9 | 12 | 17 | 17 |
| 2901 | Basic iron and steel | 9 | 9 | 9 | 10 | 11 | 12 | 9 | 11 | 18 |
| 3202 | Ships and boats | 31 | 15 | 6 | 47 | 7 | 53 | 36 | 27 | 13 |
| 6104 | Insurance | 4 | 4 | 3 | 2 | 3 | 7 | 9 | 15 | 6 |

Most of the moving industries are manufacturing industries which contribute only a small share to total output. The service industries which account for the bulk of Australian output are poorly represented. However, there are several exceptions. The Coal, oil and gas industry and the Basic iron and steel industry both account for a significant portion of exportable, importable and total output. Of particular concern is the Wholesale industry. Its shifting nature over time, combined with its large value, have a major influence on the results obtained. The special treatment of this industry is outlined in Section 3.8.

It can be reasonably concluded that a threshold of 10% allows a sensible amount of variation to filter into the measures of tradable output, without letting excessive variation distort the time series of tradable classified industries too much. This threshold serves as a natural focal point, as compared to the choice of 11% or 9%, the properties of which have been found to be only marginally different.

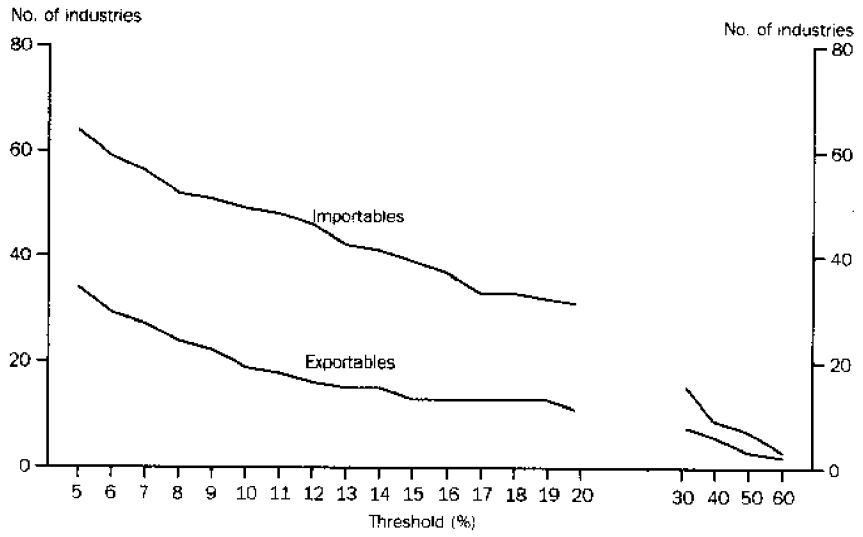
A more stable classification would be obtained if industries were classified to sectors on a subjective basis. However, the aim of this project is to develop an objective and well-documented methodology which can be used to develop a realistic measure of the size of the tradable sector in Australia. Such an aim would be defeated if the classification could not manage to reflect future changes in the industries monitored. Therefore, stability should not be an overriding aim.

The choice of a threshold value of 10% results in a profile of the tradable sector which is generally in accordance with prior expectations. The tradable sector is primarily comprised of agricultural, mining and manufacturing industries which accords with theory and previous empirical studies such as those outlined in Section 2.1.

The choice of a higher threshold of say 20% means that substantially fewer industries are included in the tradable sector and leads to results which conflict with prior expectations. On the other hand, if the threshold is reduced to say 5%, a far greater proportion of industries are classified to the tradable sector. For example, in 1986–87 a threshold of 5% would lead to 71 of 109 (65%) industries being tradable, but a threshold of 20% gives 43 of 109 (39%).

An appreciation of the effect of the change in threshold percentage and the number of industries selected can be obtained from graph 3.1 which shows threshold sensitivity for the 1986–87 data. The results for this year are indicative of the overall results. The wide difference in the number of selected industries for importables and exportables is associated with the inherent characteristics of international trade, with many more industries being import rather than export oriented.

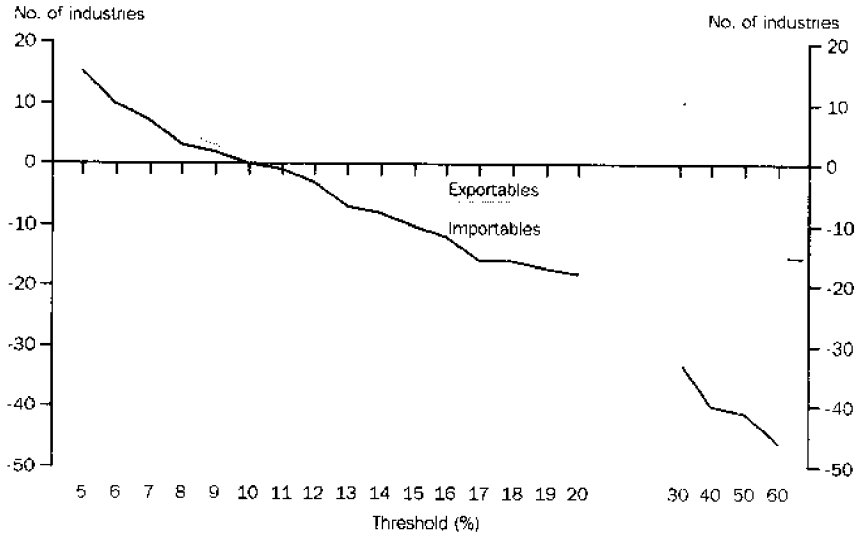
**GRAPH 3.1 THRESHOLD SENSITIVITY**



With the threshold set at 40% and 60%, the disparate nature of importables and exportables is lost, and only two to three industries are selected. For exportables, almost half of the number of industries selected are lost between 5% and 10% thresholds, with a fall from 34 to 19 industries. For importables, between 5% and 10% thresholds, there is an identical loss of 15 industries, from 64 to 49. However it is not until the decision rule is increased to 20% that half the selected industries are lost.

The impact of an increase in the threshold value upon the number of industries lost from the classification for the sector is similar for both importables and exportables in the range up to a 10% threshold. However, it alters after 10% as the graph indicates with the two plots approaching each other. This similarity can be best seen in graph 3.2 where the change in the number of industries selected as exportable/importable compared to that selected at 10% is plotted. Here it can be seen that the change in the number of industries for a 1% change in the threshold is basically identical until 12%, after which the sensitivities diverge.

**GRAPH 3.2 SENSITIVITY RELATIVE TO THE 10% THRESHOLD**




Overall, given the limited nature of both the assessment available and the terms of the requirements for the threshold level, the threshold of 10% is deemed generally suitable for the purposes of this classification.

## 3.8 The Special Case of the Wholesale Industry (IOIC 46.01)

When the measures of output in the tradable and non-tradable sectors were initially compiled, the wholesale industry was treated in the same manner as the other 108 industries. However, it was later observed that because of the size of this industry and its movement between sectors over time, the wholesale industry dominated the observed changes in the relative size of the tradable and non-tradable sectors. For this reason it was decided to treat it somewhat differently from other industries in order to obtain a more robust set of output results where movements were not driven solely by the shifts of one industry across the tradable/non-tradable threshold.

The wholesale industry is classified to the following sectors at the times given:

| | |
|---|---|
| 1974–75, 1977–78, 1978–79 | Non-tradable |
| 1979–80, 1980–81 | Exportable (tradable) |
| 1981–82, 1982–83, 1983–84 | Non-tradable |
| 1986–87, 1989–90 | Exportable (tradable) |

The estimated output shares of the exportable, tradable and non-tradable sectors using the standard methodology are given in table 3.3. Note that differences between these results and the current results (shown in table 4.1) are mainly due to the difference in the treatment of the wholesale industry.

**TABLE 3.3 SECTORAL OUTPUT SHARES: STANDARD METHODOLOGY (per cent)**

| | *Exportable* | *Tradable* | *Non-tradable* |
|---|---|---|---|
| 1974–75 | 12.4 | 26.6 | 73.4 |
| 1977–78 | 10.5 | 24.7 | 75.3 |
| 1978–79 | 12.0 | 25.6 | 74.4 |
| 1979–80 | 19.4 | 32.9 | 67.1 |
| 1980–81 | 17.7 | 32.2 | 67.8 |
| 1981–82 | 9.1 | 23.5 | 76.5 |
| 1982–83 | 8.7 | 22.0 | 78.0 |
| 1983–84 | 10.7 | 22.9 | 77.1 |
| 1986–87 | 18.0 | 31.4 | 68.6 |
| 1989–90 | 18.2 | 29.7 | 70.3 |

When the wholesale industry is classified as exportable it contributes about 35% of exportable output and 20% of tradable output. When it is classified as non-tradable it contributes about 10% of non-tradable output. Due to this large contribution, when the industry drops out of the exportable sector in 1981–82, both exportable and tradable output shares decline substantially. The shifts of this industry over time dominate the observed movements in the size of the tradable, non-tradable and exportable sectors. Thus, the share of the exportable sector increases dramatically in 1979–80 and 1986–87. The dominant influence of this one industry thus obscures any real movement in the importance of the tradable or non-tradable sectors over the past two decades.

Due to the extraordinary influence of this sector, it was deemed necessary to treat it in a non-standard manner (analogous to the Kent and Scott procedure discussed in Section 2.2). The output of the wholesale industry is attributed proportionately to the exportable (tradable) and non-tradable sectors over time. Thus when the export orientation ratio is 12%, 12% of output is allocated to the exportable sector with the remainder allocated to the non-tradable sector. The output of each sector is recalculated based upon this allocation of the output of the wholesale industry. The results are markedly different. In particular, the shares of tradable and non-tradable output over time are far more stable. It is believed that treating the wholesale industry in the standard way led to incorrect interpretations of the pattern of change in the importance of tradable and non-tradable goods over time.

The estimated output shares of each of the sectors, with the new allocation of wholesale industry output, are provided in table 4.1. The output shares change only slowly over time, this being more realistic than the volatile movements observed using the original treatment of the wholesale industry. This revised allocation of wholesale industry output is used in producing all of the results which are presented in this working paper.

# 4. RESULTS: PROFILE AND OUTPUT OF THE TRADABLE SECTOR

The results of this study of the division of output between the tradable and non-tradable sectors are presented and analysed in this section. The analysis is performed from several angles with the aim of revealing some of the latent features of the data.

## 4.1 Sectoral Shares

A summary of the results of Dwyer (1990) is shown in table 2.3. Graph 4.1 shows the movement in the size of the tradables share of output, using the estimates from this study. The information portrayed in the graph is shown in table 4.1 below. Unless stated otherwise, the results adopt a producer prices valuation basis. The results of this study are in accordance with the results obtained by Dwyer (1987, 1990). The estimated share of the tradable sector is substantially less than that obtained through the subjective approach (about 30%) or by summing the value of actual imports and exports (about 40%).

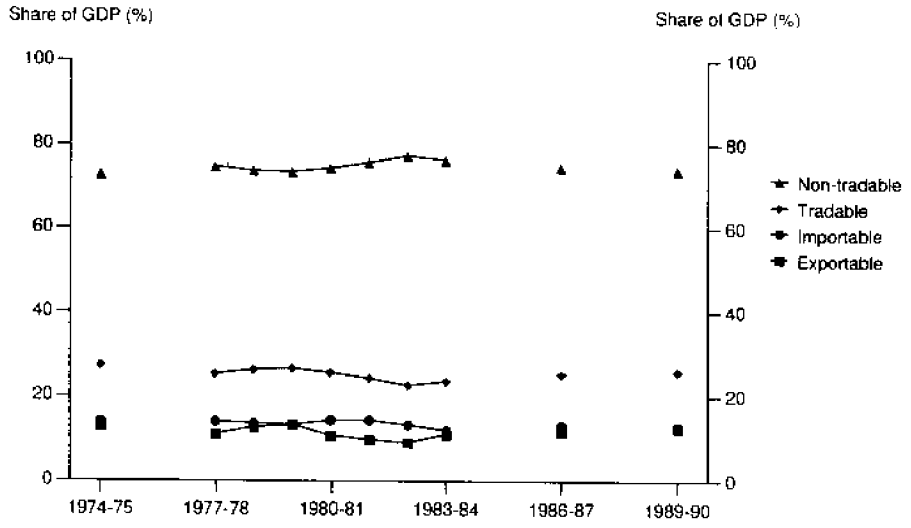
**TABLE 4.1 COMPARISON OF OUTPUT SHARES OVER TIME, PROPORTION OF GDP (per cent)**

| | *Importable* | *Exportable* | *Tradable* | *Non-tradable* |
|---|---|---|---|---|
| 1974–75 | 14.2 | 13.0 | 27.2 | 72.8 |
| 1977–78 | 14.2 | 11.1 | 25.4 | 74.7 |
| 1978–79 | 13.6 | 12.7 | 26.3 | 73.7 |
| 1979–80 | 13.4 | 13.3 | 26.7 | 73.3 |
| 1980–81 | 14.6 | 10.9 | 25.5 | 74.5 |
| 1981–82 | 14.5 | 9.7 | 24.1 | 75.9 |
| 1982–83 | 13.3 | 9.3 | 22.6 | 77.4 |
| 1983–84 | 12.2 | 11.2 | 23.5 | 76.6 |
| 1986–87 | 13.4 | 11.9 | 25.3 | 74.7 |
| 1989–90 | 13.0 | 12.8 | 25.8 | 74.2 |
| | | | | |
| Minimum | 12.2 | 9.3 | 22.6 | 72.8 |
| Maximum | 14.6 | 13.3 | 27.2 | 77.4 |
| Range | 2.4 | 4.0 | 4.6 | 4.6 |
| RSE | 0.05 | 0.11 | 0.05 | 0.02 |

In general the tradable sector accounts for about one quarter of total output. Importables contribute a slightly greater share of tradable output than do exportables, although the share of exportables has increased in recent years.

The tradable share of output fell in the early 1980s and has subsequently increased to approximate its share in the late 1970s. This reflects the considerable fall in the early 1980s of the exportable share which has shown a sustained increase in recent years and is now approaching the share of importables in GDP. The tradables share of GDP was at its lowest in 1982–83, a year of recession and drought.

## GRAPH 4.1 COMPARISON OF OUTPUT SHARES OVER TIME




The exportable sector of the Australian economy has clearly grown over the past decade, with both the volume of exports and the share of GDP contributed by export-oriented industries increasing significantly. The importable share has been fairly steady since 1982–83 contributing around 13% of output, but the relative size of the import competing sector has declined somewhat since the early 1980s. This is consistent with the trend rise in the import penetration of the domestic market over the same period. Since the early 1980s there has been a re-direction of domestic production towards exporting and away from import replacement.

It is readily seen that the tradable sector displays a reasonable amount of change in its size over time. Exportables appear to be the main contributor to this change, as is made clear by table 4.2. Whenever the export share increases (/decreases), so does the tradable share.

The relatively volatile nature of exportables is further confirmed by the relative standard errors (RSE) of the shares. The RSE adjusts for the different magnitudes of the shares by dividing the standard error by the mean. The RSE is low for the importables share at 0.05, while the exportables RSE is more than twice this level at 0.11. The range of variation of the shares also indicates that most of the magnitude of movement in tradables share generally emanates from the exportables.

**TABLE 4.2 SIZE AND DIRECTION OF CHANGES BETWEEN OBSERVATIONS, PROPORTION OF GDP (per cent)**

| | *Change in importables* | *Change in exportables* | *Change in tradables* |
|---|---|---|---|
| 1974–75 to 1977–78 | 0.05 | –1.88 | –1.83 |
| 1977–78 to 1978–79 | –0.63 | 1.58 | 0.95 |
| 1978–79 to 1979–80 | –0.18 | 0.59 | 0.41 |
| 1979–80 to 1980–81 | 1.15 | –2.36 | –1.21 |
| 1980–81 to 1981–82 | –0.13 | –1.24 | –1.37 |
| 1981–82 to 1982–83 | –1.11 | –0.43 | –1.54 |
| 1982–83 to 1983–84 | –1.12 | 1.97 | 0.85 |
| 1983–84 to 1986–87 | 1.18 | 0.68 | 1.86 |
| 1986–87 to 1989–90 | –0.40 | 0.89 | 0.49 |

The usefulness of dividing tradables into importables and exportables is clear from the divergent movement of these sectors, as shown in graph 4.2. The two series peak in different years: 1979–80 for exportables and a year later in 1980–81 for importables. They also reach their minimum level a year apart: 1982–83 for exportables, and the following year 1983–84 for importables. The maximum exportables share in 1979–80 can be explained by the resources boom which occurred at this time, while the trough in 1982–83 coincides with a severe drought. The influence of the mining and agricultural industries can largely explain the observed volatility in the exportable share of output relative to the shares of other sectors.

**GRAPH 4.2 EXPORTABLE AND IMPORTABLE SHARES**

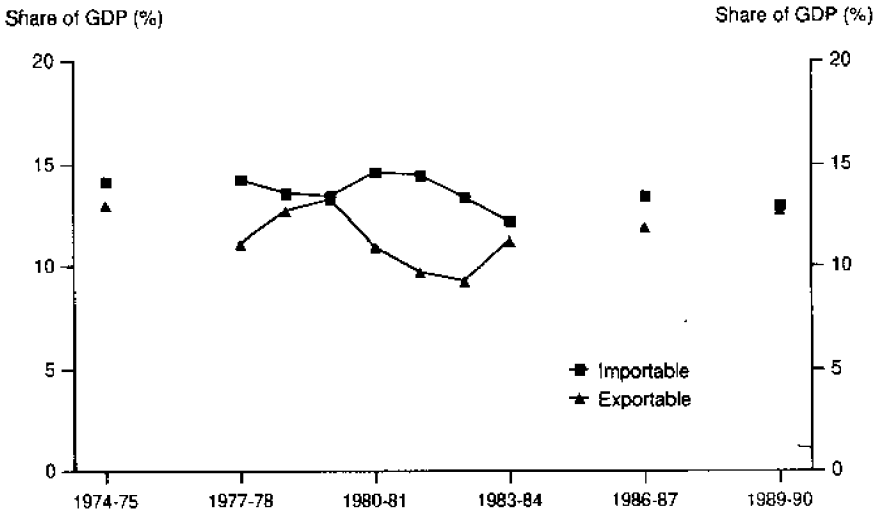



Table 4.3 shows the difference over time between the sectoral GDP shares derived when GDP is measured alternatively at producer prices and at factor cost. The GDP share gap is calculated for each sector as the share of GDP valued at producer prices less the share of GDP valued at factor costs. It can be seen that the GDP share gap holds very distinct properties for the importable and exportable shares of total output.

**TABLE 4.3 GDP SHARE GAP (per cent)**

| | *Importables* | *Exportables* |
|---|---|---|
| 1974–75 | 1.24 | –0.32 |
| 1977–78 | 1.33 | –0.30 |
| 1978–79 | 1.41 | –0.25 |
| 1979–80 | 1.37 | –0.68 |
| 1980–81 | 1.25 | –0.47 |
| 1981–82 | 1.36 | –0.59 |
| 1982–83 | 1.77 | –0.60 |
| 1983–84 | 2.01 | –0.45 |
| 1986–87 | 2.83 | –0.76 |
| 1989–90 | 2.16 | –0.53 |

The share of importables in GDP at factor cost lies substantially beneath the share of GDP at producer prices. This reveals the considerable contribution taxation makes to GDP. For exportables the share of GDP at factor cost lies above the share of GDP at producer prices, indicating the subsidisation of export output. The difference between the sectoral shares of GDP measured at factor cost and producer prices is attributable to the allocation of taxation to imports and exports in government policy. This is an economic characteristic which is useful to measure. The differential between the importable GDP measures indicates the importance of the tax contribution to value-added output. A widening or narrowing of the gap might indicate changes to the tax regime. Monitoring of the sectoral GDP share gaps may allow comparative analysis of the effects arising from changes to the tax regime on output, or to associated economic factors such as employment, prices and investment.

For importables, the gap between the different GDP measures of import competing output is positive, representing taxes. It is fairly constant over time, although it does fluctuate slightly. The general trend suggests an increase in the gap over time.

For exportables the GDP share gap is negative — representing net subsidies — and smaller in magnitude than the importable GDP share gap. As for importables, there is a suggestion that the GDP share gap for exportables has increased over the period considered. The GDP share gap reaches its most extreme value in 1986–87 for both importables and exportables. In 1989–90 the extent of taxation of importables and subsidisation of exportables was less than in 1986–87. In general the two measures do not show similar movements. The GDP share gaps are not obviously influenced by the movement in the GDP measures of importables and exportables themselves.

## 4.2 Composition of Sectors

In this section, the industries which contribute output to the tradable sector are examined more closely. Appendix 2 shows the allocation of each of the 109 input-output industries to sectors for each year an input-output table is released. Each industry is identified as importable (m), exportable (x) or non-tradable (n). Some industries are both importable and exportable for a particular year, while the Wholesale industry (47.01) is allocated to both the exportable and non-tradable sectors over the entire period. This table enables shifting industries to be detected and provides information on the composition of each sector. However, it provides little information as to which industries account for a substantial share of sectoral output.

From Appendix 2 it can be seen that the classification of industries to sectors is not static over the period considered. A number of industries shift between sectors over time. If these shifting industries represent a substantial portion of output, their movements can significantly influence the results.

With the exception of transport services, the service industries are predominantly non-tradable. Most of the industries which form the importable sector are from the manufacturing industry. Very few manufacturing industries are classified as exportable. The exportable sector is comprised mainly of agricultural, mining and transport services industries.

Previous studies have often allocated broad industry categories such as mining, agriculture, construction and manufacturing to the tradable and non-tradable sectors. Appendix 2 illustrates that substantial portions of the agricultural and manufacturing industries which are generally regarded as tradable, are in fact non-tradable. Similarly, the tradable nature of some disaggregated service industries may not be recognised. Such studies have overestimated the size of the tradable sector through the use of broad industry categories.

Table 4.4 highlights the 109 level industries which contribute 5% or more of sectoral output for each of the importable, tradable and non-tradable sectors, at any point in time. For the exportable sector the threshold value is raised to 10% due to the small number of industries which contribute output to this sector. The influential industries identified in this table may significantly affect the sectoral share results if their output changes substantially or if the industry shifts between sectors.

**TABLE 4.4 INFLUENTIAL INDUSTRIES**

| *Sector* | *Influential industries* | | *'Moving' industry?* |
|---|---|---|---|
| Importable | | | |
| | 106 | Agriculture n.e.c. | Yes |
| | 1200 | Coal, oil and gas | Yes |
| | 2708 | Petroleum, coal products | No |
| | 2901 | Basic iron and steel | Yes |
| | 3103 | Metal products n.e.c. | No |
| | 3201 | Motor vehicles etc. | No |
| | 3307 | Machinery, equipment n.e.c. | No |
| Exportable | | | |
| | 102 | Cereal grains | No |
| | 1102 | Non-ferrous metal ores | No |
| | 1200 | Coal, oil and gas | Yes |
| | 2901 | Basic iron and steel | Yes |
| | 5701 | Services to transport | No |
| Tradable | | | |
| | 0102 | Cereal grains | No |
| | 1102 | Non-ferrous metal ores | No |
| | 1200 | Coal, oil and gas | No |
| | 2708 | Petroleum, coal products | No |
| | 3201 | Motor vehicles etc. | No |
| | 5701 | Services to transport | No |
| Non-tradable | | | |
| | 4102 | Construction n.e.c. | No |
| | 4701 | Wholesale trade | No |
| | 4801 | Retail trade | No |
| | 6105 | Business services n.e.c. | No |
| | 6106 | Ownership of dwellings | No |
| | 8101 | Health | No |
| | 8201 | Education, libraries etc. | No |

For the importable sector, the Motor vehicles and Petroleum and coal products industries contribute more output than any other industries. Both of these industries remain in the importable sector over the entire period considered. However, the Coal, oil and gas industry, which contributes up to 10% of importable output, is no longer classified as part of the importable sector in 1986–87 and 1989–90.

As well, by far the major contributor to the exportable sector is the Coal, oil and gas industry. Its importance has increased in recent years and it now accounts for about a quarter of sectoral output. This industry has remained part of the exportable sector over time but was also part of the importable sector until 1983–84. The Services to transport industry has accounted for about 10% of exportable output since entering the classification system in 1983–84. Due to the small number of industries in the exportable sector, twelve industries contribute more than 5% of sectoral output. The relative contributions of the component industries fluctuate substantially in the exportable sector, particularly compared to the non-tradable sector.

The dominant industries in the tradable sector are the most influential industries from both the importable and exportable sectors. All of the listed industries remain in the tradable sector over the entire period.

All of the most influential non-tradable industries are service industries. The Wholesale industry is classified as a non-shifting industry. Prior to introducing the revised methodology this industry had a substantial impact on the sectoral share results due to its frequent movement between the exportable and non-tradable sectors. The Ownership of dwellings industry contributes the largest share of non-tradable output. All of the listed industries remain in the non-tradable sector over the entire period, and the contribution of each industry is quite stable over time.

Are any of these influential industries having an undesirable impact on the measurement of sectoral shares? The Wholesale industry, due to its shifting nature, was dominating movements in sectoral shares prior to the introduction of the revised methodology. Most of the remaining influential industries do not shift between sectors over time. A prominent exception is the Coal, oil and gas industry. This industry is the main contributor to exportable output. Until 1983–84 the output of this industry was classified as both importable and exportable. In 1986–87 and 1989–90 the industry was solely exportable. There is no reason to believe there has not been a real shift in orientation of the industry towards exporting. In contrast, no trend movement was apparent in the Wholesale industry which frequently shifted between sectors. For this reason no special treatment is necessary for the Coal, oil and gas industry, but its influence will be kept in mind when interpreting the sectoral price results.

Table 4.5 illustrates the composition of the exportable sector and how it has changed over time. Table 4.6, table 4.7 and table 4.8 provide the same information for the importable, tradable and non-tradable sectors respectively. In these tables the economy is broken down into four major industry groups: agriculture, mining, manufacturing and services. Specific components of these industry groups which contribute a large share of sectoral output or show considerable change over time are also highlighted.

Most evident from table 4.5 is the decline in the importance of agriculture to exportable output and a corresponding increase in the contribution of the mining industries. In particular, the share of the Coal, oil and gas industry in exportable output has increased in recent years.

**TABLE 4.5 COMPOSITION OF THE EXPORTABLE SECTOR (per cent)**

| *Industry group* | *1974 –75* | *1977 –78* | *1980 –81* | *1983 –84* | *1986 –87* | *1989 –90* |
|---|---|---|---|---|---|---|
| **Agriculture** | *23.2* | *17.2* | *20.8* | *20.2* | *13.2* | *14.6* |
| Sheep | 8.5 | 9.7 | 9.1 | 6.5 | 6.8 | 8.7 |
| Cereals | 13.9 | 6.3 | 10.2 | 12.5 | 5.7 | 4.8 |
| **Mining** | *23.6* | *26.6* | *27.8* | *35.3* | *42.1* | *36.0* |
| Ferrous metal ores | 5.6 | 5.5 | 4.5 | 4.8 | 3.8 | 3.3 |
| Non-ferrous metal ores | 9.3 | 9.0 | 10.1 | 6.6 | 7.9 | 8.7 |
| Coal, oil and gas | 8.7 | 12.1 | 13.2 | 21.2 | 28.5 | 22.3 |
| **Manufacturing** | *30.1* | *32.9* | *25.8* | *19.4* | *19.5* | *26.8* |
| Food products | 13.0 | 16.1 | 16.0 | 11.8 | 11.3 | 11.0 |
| Metal products | 16.8 | 16.4 | 8.0 | 5.8 | 6.4 | 14.6 |
| **Services** | *23.1* | *23.3* | *25.6* | *25.1* | *25.2* | *22.6* |
| Wholesale trade | 4.7 | 5.6 | 6.9 | 5.3 | 5.6 | 4.5 |
| Transport | 12.9 | 16.1 | 18.7 | 19.8 | 19.6 | 18.1 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

The share of manufacturing in exportables fell during the early and mid-1980s but has recently improved considerably. This is in large part due to the larger share of Basic and fabricated metal products. The share of the services industries in the exportable sector has remained relatively constant, and continues to be dominated by Transport services.

An increase in the contribution an industry group makes to exportable output may be due to an increase in the output of a component industry which is classified as exportable. Alternatively it may be a result of a component industry shifting into the exportable sector due to an increase in the industry's export orientation. Also, if a component industry is classified as both importable and exportable its output is allocated between the two sectors. If the import penetration ratio of such an industry falls below the 10% threshold, an increase in the output of the industry allocated to the exportable sector will be observed even if the industry's actual gross product has remained constant or decreased. This effect on exportable output is observed for the Coal, oil and gas industry when it moves out of the importable sector in 1986–87.

From table 4.6 it can be seen that the share of agriculture and mining industries in importable output is both small and volatile. The volatility is a result of several moving industries. Services industries make up a small but fairly stable share of importable output. It is manufacturing industries which dominate the importable sector. The contribution of Textiles, clothing and footwear to importables has declined in recent years, while that of the Petroleum industry has increased. The Metal products industry has a rather volatile share due to moving industries. The Motor vehicles and Machinery and equipment industries are also important components of the importable sector.

**TABLE 4.6 COMPOSITION OF THE IMPORTABLE SECTOR (per cent)**

| *Industry group* | *1974 –75* | *1977 –78* | *1980 –81* | *1983 –84* | *1986 –87* | *1989 –90* |
|---|---|---|---|---|---|---|
| **Agriculture and Mining** | 6.8 | 8.9 | 13.1 | 8.7 | 6.8 | 1.0 |
| **Manufacturing** | *88.2* | *86.5* | *82.9* | *87.3* | *88.0* | 95.5 |
| Textiles clothing and footwear | 9.4 | 9.4 | 8.1 | 8.1 | 7.2 | 6.5 |
| Paper products, printing | 5.8 | 5.9 | 5.9 | 6.5 | 6.7 | 6.4 |
| Chemicals | 4.7 | 6.3 | 6.7 | 7.8 | 6.5 | 8.2 |
| Petroleum and coal products | 7.4 | 7.5 | 5.9 | 10.7 | 15.7 | 14.1 |
| Metal products | 4.6 | 5.4 | 13.1 | 4.8 | 9.0 | 7.6 |
| Motor vehicles | 11.8 | 11.7 | 9.4 | 11.1 | 9.4 | 13.9 |
| Machinery and equipment | 20.5 | 17.3 | 15.1 | 13.7 | 12.3 | 13.9 |
| **Services** | 5.0 | 4.6 | 4.0 | 4.0 | 5.2 | 3.5 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

From table 4.7 it is evident that agriculture and services industries contribute only a small share of tradable output. The mining industries, especially Coal, oil and gas, contribute a significant share of tradable output. However, most tradable output is produced by manufacturing industries, the most significant of which are highlighted in the table.

Table 4.8 shows the industry composition of the non-tradable sector. It is dominated by services industries. Agriculture and mining industries are of little importance, while manufacturing industries contribute a small and declining share of non-tradable output. The importance of services industries to the non-tradable sector has increased over the period considered partly due to the increased output of the Business services industry. Both the tradable and non-tradable sectors exhibit significant changes in their composition over the period examined.

TABLE 4.7 COMPOSITION OF THE TRADABLE SECTOR (per cent)

| *Industry group* | *1974 –75* | *1977 –78* | *1980 –81* | *1983 –84* | *1986 –87* | *1989 –90* |
|---|---|---|---|---|---|---|
| **Agriculture** | 11.2 | 7.7 | 8.9 | 9.7 | 9.3 | 7.3 |
| **Mining** | *14.7* | *16.5* | *19.4* | *21.4* | *20.3* | *18.3* |
| Coal, oil and gas | 6.4 | 8.9 | 12.0 | 14.7 | 13.4 | 11.0 |
| **Manufacturing** | *60.5* | *63.0* | *58.5* | *54.8* | *55.8* | *61.4* |
| Petroleum and coal products | 3.9 | 4.2 | 3.3 | 5.6 | 8.3 | 7.1 |
| Metal products | 10.4 | 10.2 | 10.9 | 5.3 | 7.8 | 11.1 |
| Motor vehicles | 6.2 | 6.6 | 5.4 | 5.8 | 5.0 | 7.0 |
| Machinery and equipment | 10.7 | 9.7 | 8.7 | 7.2 | 6.7 | 7.0 |
| **Services** | *13.6* | *12.8* | *13.2* | *14.1* | *14.6* | *13.0* |
| Transport | 8.7 | 9.6 | 10.3 | 11.6 | 10.9 | 10.7 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

TABLE 4.8 COMPOSITION OF THE NON-TRADABLE SECTOR (per cent)

| *Industry group* | *1974 –75* | *1977 –78* | *1980 –81* | *1983 –84* | *1986 –87* | *1989 –90* |
|---|---|---|---|---|---|---|
| **Agriculture and Mining** | 4.6 | 3.6 | 4.4 | 4.0 | 2.3 | 3.3 |
| **Manufacturing** | 8.8 | 8.4 | 7.7 | 7.7 | 6.5 | 5.5 |
| **Services** | *86.6* | *88.0* | *87.9* | *88.3* | *91.2* | *91.2* |
| Wholesale and retail trade | 19.2 | 18.9 | 18.1 | 15.8 | 17.3 | 17.1 |
| Business services | 12.1 | 13.3 | 14.6 | 14.6 | 14.2 | 17.2 |
| Health, education and welfare | 12.4 | 15.1 | 14.5 | 16.2 | 16.6 | 15.2 |
| Construction | 10.9 | 9.7 | 9.0 | 9.6 | 9.9 | 9.6 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

# 5. FORMING A TRADABLES PRICE INDEX

In the previous section, the industry profile and output of the importable, exportable, tradable and non-tradable sectors was determined. This information provides a set of weights which will be applied to disaggregated price data to form composite price indexes corresponding to each of these sectors.

The aim is to produce tradables and non-tradables price indexes. The tradables price index will be divisible into importable and exportable price indexes. Price indexes corresponding to the 28 industry level of the IOIC will also be calculated. The method used corresponds to Dwyer (1992) and involves the matching of price data to each of the 109 input-output industries. This involves bringing together domestic price data from a variety of sources. The ability to closely match price information to industries will affect the quality of the price indexes formed, as will the method of identifying tradable output and the choice of price index formula.

In previous studies, the price of tradables has been proxied by the price of imports or exports, or a weighted average of the two. The price of non-tradables is usually proxied by the consumer price index or the implicit price deflator for GDP. Use of an export price index as a measure of the price of tradables is superior to use of an import price index (Goldstein & Officer 1979, p. 416). This is because it only requires the assumption that export and domestic prices move closely together, and not the additional assumption that export prices from various countries are also aligned. Such proxies measure the price movement of tradables by the price movements of goods actually traded. However, this may not necessarily be the best procedure. In a study of export and domestic price movements, Kravis and Lipsey (1978) come to the following conclusion:

> We find that there are sometimes substantial and prolonged divergences between the export price movements of different countries for the same or closely related products and notable differences within countries between export and domestic price changes.

It follows that the preferred measure of the price of tradables should reflect price movements of goods and services which are actually traded internationally and goods and services which are potentially tradable.

Previous estimates of the relative price of tradable and non-tradable goods in Australia have been made by Wilson (1931), Shann (1982), Pitchford (1986) and Dwyer (1987, 1990, 1992). These estimates of relative domestic prices have been used to measure the internal competitiveness of Australia's tradable sector. The development of measures of tradable and non-tradable prices enables an analysis of the extent to which relative domestic prices influence the allocation of employment and investment across sectors. Further, the price indexes compiled in this project will be a valuable resource for those seeking to explore the determinants of international trade flows, the behaviour of real exchange rates or the sources of inflationary pressure.

Goldstein and Officer (1979) produced price indexes for the tradable and non-tradable sectors which extended the definition of tradable goods beyond those actually traded. Three broad industry divisions (Agriculture, Mining and Manufacturing) were nominated as tradable according to prior belief, with all remaining industries deemed to be non-tradable. A price index for the tradable sector could then be calculated as a weighted average of the implicit price deflators for the gross product of these industries. Three limitations of this approach are identified, and will be discussed in turn below.

For many countries, GDP by industry is only available on an annual basis, and so it may not be feasible to generate quarterly or monthly price indexes. As Goldstein and Officer (1979) point out, this '. . . may inhibit precise estimates of the timing of various economic relationships'. In this project, the majority of the source price data are available on a monthly or quarterly basis, meaning that quarterly price indexes for the tradable and non-tradables sectors can be estimated.

Because implicit price deflators are used, the price indexes for the tradable and non-tradable sectors are current weighted indexes. In circumstances where it is desirable to analyse pure price movements, unaffected by changes in the composition of the tradable sector, a fixed weight index will be preferred to a current weighted index. However, in many circumstances, it will be

desirable to analyse a tradables price index which reflects changes in the composition of the sector over time. In this project, both base-year weighted and current weighted price indexes for the tradable and non-tradable sectors are constructed.

Due to data limitations, only broad industry divisions could previously be nominated as tradable or non-tradable. The result of this is that some tradable output will undoubtedly be included in the non-tradable sector, and vice-versa. By allocating such broad industry divisions to the tradable sector, the size of the tradable sector is likely to be overstated, and the price movements may be unrepresentative. In this paper, the allocation of industries to the tradable and non-tradable sectors occurs at a highly disaggregated level, overcoming this limitation. It has also been possible to obtain a fairly close matching of price data to the disaggregated input-output industries.

In addition, the industry gross product deflators are not necessarily a reliable measure of price change for an industry. The implicit price deflator for an industry is calculated as current price industry gross product divided by constant price industry gross product. An important determinant of their reliability is the method by which constant price industry gross product is constructed, which in turn is dependent on data limitations and availability. The 'least satisfactory method uses hours worked data to extrapolate base year gross product. It is used to obtain estimates for Public administration and defence, Finance, property and business services and Community services' (ABS Cat. no. 5216.0, para. 18.3). The assumption underlying this procedure is that there is no change in gross product at constant prices per hour worked. For an industry which is undergoing substantial productivity change, the estimate of constant price gross product, and hence the implicit price deflator, may be unreliable.

A further limitation, not discussed by Goldstein and Officer (1979), is the inherent subjectivity of the allocation of industries to the tradable or non-tradable sectors. As discussed earlier, the work presented in this paper is based on Dwyer (1992) who uses an objective system to classify industry output as tradable or non-tradable using input-output data. As Dwyer notes: 'To the extent the classification system adopted in this paper yields an actual representation of sectoral output, these indexes approach actual prices.'

The methodology used in compiling the sectoral price indexes is largely based on the work of Dwyer (1992). Dwyer's matching of price data to industry is taken as the starting point, and this is improved upon wherever possible, so that a more precise and consistent matching of price data to input-output industry is achieved. Details of the methodology are provided in Section 6.

An important advance is the consideration of the choice of price index formula. Previous estimates of the price of tradables have not considered this issue, despite evidence that measurement of price changes is quite sensitive to the choice of price index formula — particularly if price changes are volatile or seasonal. This issue will be discussed in more detail in Section 6.3.

There is a recognised difficulty in obtaining data along tradable and non-tradable lines. This project seeks to address the problem by compiling a database of output and price data for the importable, exportable, tradable and non-tradable sectors, and the component industries. The final estimates should be valuable in the analysis of the size and competitiveness of Australia's tradable sector. The price of tradable and non-tradable goods is relevant to studies of purchasing power parity, the effects of exchange rate movements, the determinants of inflation, and the flow of resources between sectors in the Australian economy.

# 6. PRACTICAL DEVELOPMENT OF THE TRADABLES PRICE INDEX

## 6.1 Matching Price Data to Input-Output Industries

To construct composite price indexes for the tradable and non-tradable sectors, we first need to form price indexes for each of the component industries. It is necessary to form a price index for each of the 109 input-output industries. Price data from a variety of data sources are used to construct these disaggregated price indexes.

The process of matching an input-output industry with a representative price index involves consideration of a number of conceptual and practical issues. It is these issues which are to be discussed in the following subsections.

### *6.1.1 Pricing Basis*

What is of interest for this study is the *price received by domestic producers for their output*, regardless of whether the product was sold domestically or exported. It is these prices which are the basis for decisions as to the allocation of resources. It should be noted that the focus is on the prices received by producers rather than the prices paid by consumers. The two may differ since consumer prices reflect indirect taxes and subsidies and assorted margins (retail, wholesale, transport).

Wherever possible, data approximating this concept have been employed in constructing the initial 109 industry level price indexes. As a result, the tradable and non-tradable price indexes will closely reflect the concept of the prices received by domestic producers for their output. Domestic producers sell some of their product domestically and export the remainder. The price received for a product may differ according to whether it is sold domestically or overseas. Preferably, the price data used should exclude import prices, but reflect prices received for exported output.

Ideally, in accordance with the measurement of industry and sectoral output in Section 3, price indexes should be constructed on both a producer price and factor cost (or basic values) valuation basis. For many applications factor cost data would be preferred as it abstracts from distortions caused by taxes. However, in analyses where the impact of the tax regime is important, producer price measures are useful. For this reason it is preferred that the composite price indexes be available on both a producer price and factor cost basis.

However, just obtaining a data source for a specific industry which corresponds to the concept of the 'price received by domestic producers for their output' is difficult (and has not been possible for many service industries). For no industry is there a further choice available between an index valued at producers prices and one at basic values. As a result, the source price data involves a mixture of valuation bases. Weights will be calculated from the estimates of industry gross product which have been derived from input-output table data.[9] Like the output estimates presented in Section 4, these weights will be valued at producer prices.

It would also be possible to compile an alternative set of sectoral price indexes by using estimates of industry gross product valued at factor cost to calculate weighting time series. While the output measures (and hence the weights) can differ considerably depending on whether a factor cost or producer price valuation basis is adopted, the classification of industries to sectors is unaffected. The authors would appreciate any feedback from potential users as to which output valuation basis would be preferred for specific applications.

While price data matching the concept of the 'price received by domestic producers' are available for most tradable industries, this is not the case for many service industries. The Price Indexes of Articles Produced by the Manufacturing Industry (APMI) and Australian Bureau of Agricultural and Resource Economics (ABARE) data sources (see Section 6.1.3), which are used for the manufacturing and agricultural industries respectively, reflect both the export price and the

[9] Details of the method of deriving weighting time series are discussed in Section 7.2. Details of the method of deriving measures of industry gross product valued at producer prices are discussed in Section 3.

domestic price. However, in industries where consumer price data must be used the price of imports will directly impact upon the sectoral price indexes if import penetration is high for that industry.

It has been necessary to use Consumer Price Index (CPI) or Private Final Consumption Expenditure (PFCE) implicit price deflators for some service industries. PFCE deflators are used in preference to CPI data for industries such as Health and Education where government subsidies are important. This is because they better capture the true cost to producers of providing a service.

For many service industries, National Accounts industry gross product deflators were used. Unlike the PFCE deflators, the measures of current and constant price gross product come from separate sources: current price data are not explicitly deflated. Current price industry gross product is derived according to the income approach and is measured at market prices.

A possible alternative is to produce importable and exportable price indexes both at domestic prices and at import prices paid/export prices received. Importables would then have a domestic, import-competing, price and an import price. Exportables would have an export price and a domestic price. Data on prices received by producers from domestic sales alone are not readily available, and so this alternative cannot be practically implemented.

### 6.1.2 Time Period, Frequency and Base Year

The time period over which the price indexes were constructed was from 1977–78 to the present. Input-output table data are only available using the present methodology from 1974–75, so this is the earliest time the series could commence.[10] The main determinants of the decision to commence the price indexes in 1977 were the effects of a substantial revision to ASIC, and the dearth of suitable and continuous data the further back the time period is extended.

The change from ASIC 1969 to ASIC 1978 was substantial, and involved the introduction of new classes and codes and revisions to class definitions. This means that there are problems with linking a 1974–75 class to a 1977–78 class. Since price data are often collected by ASIC class, the revision will also have substantial impact on price data and their correspondence to IOIC industries. Overall, the far-reaching nature and complexity of these changes to ASIC mean that to produce consistent and continuous price series beginning before 1977–78 would be very difficult.

A further problem is the increasing difficulty of obtaining access to data the further back the time period is extended. If the time period was extended back to 1974–75, the current data sources could not be used for about ten of the 109 level industries. Any alternative data source would have considerably lower correspondence to the relevant sector. Even in obtaining data over the determined period it was not always possible to find a continuous data source corresponding to a sector.

The changes to ASIC in 1983 were not as extensive. The effects were limited to the transport and storage industries. Its also possible that the change to ANZSIC may have further effects on the compilation of tradable and non-tradable price indexes. The changeover to ANZSIC in the National Accounts data meant that continuous industry gross product implicit price deflators were no longer available.[11] However, the increased level of detail of the ANZSIC-based implicit price deflators for the service industries was an advantage. To date there has been no impact of ANZSIC on the manufacturing industry because the APMI data continue to be compiled according to ASIC.

[10] Input-output tables were released for 1958–59, 1962–63 and 1968–69 using a different methodology.

[11] ANZSIC-based implicit price deflators can only be calculated from 1982–83, while ASIC-based implicit price deflators are not available beyond 1992–93.

For all 109 level industries price data are available from the September quarter 1976 to the June quarter 1994. Most series are available until the June quarter 1995. Many price indexes are available earlier than 1976. However, the lack of adequate weighting data prior to 1977–78 and after 1989–90 is a substantial restriction. As price and weighting data are available from the September quarter 1976, this is sufficient to compile a composite price index commencing in the March quarter 1977.

Obviously, price movements in tradable and non-tradable goods after June 1990 are of substantial interest, and so it is desirable to produce sectoral price indexes after 1989–90. An option is to apply the 1989–90 weights to the price data. These weights will be somewhat out-of-date by 1995 and so this will only be a temporary solution until more recent input-output table data become available.

The frequency of the price indexes to be constructed will be quarterly. This is considered frequent enough to be able to detect price fluctuations (when using annual data some changes may be obscured), to provide a substantial time series (using annual data would provide under twenty observations), and to be consistent with the available source data (price data for service industries are not available on a monthly basis).

For some of the service industries data are only available annually.[12] It is therefore necessary to interpolate these data to obtain quarterly observations. This has been done using the linear trend method of interpolation. In the base year, the average of the four quarterly values is equal to 100 under this method.

The base for all price indexes in the tradables database was chosen to be 1989–90 = 100. The year was chosen in accordance with the most recent standard base year for ABS data. All CPI and National Accounts data are currently on a 1989–90 base. As the base year is fairly recent it should not be necessary to change it in the near future, and the interpretation of recent price movements is facilitated.

### 6.1.3 *The Matching Process*

Gathering fairly disaggregated price data from a variety of sources to compile price indexes corresponding to 109 level input-output industries is a substantial task. The data sources which have been utilised are listed below, in order of prominence:

- APMI
  This is the data source for all manufacturing industries. Data are compiled monthly, it is classified according to ASIC and accords with the concept of the price received by producers for their output.
- Price Indexes of Materials Used in the Manufacturing Industry (MUMI)
  This was the data source for all mining industries, as well as Electricity, Gas, Forestry, Fishing and hunting, and Wholesale trade. This data source is compiled monthly and measures the price paid by manufacturers for their inputs.
- Indexes of Prices Received and Paid by Farmers (from ABARE)
  This was the data source for all agricultural industries. The quarterly ABARE price indexes measure the price received by farmers for their output and the prices paid by farmers for their inputs, respectively.
- National Accounts: industry gross product
  This was the data source for several service industries including Public administration, Defence, Business services, and Transport and storage. Current and constant price industry gross product data are used to derive a deflator. A shortcoming is that current price gross product is only compiled at a highly aggregate level and is only available annually. Where constant price industry gross product is estimated by extrapolating base year gross product by hours worked, the implicit price deflators may not be very reliable if the industry is subject to significant changes in technology or productivity.

[12] The service industries for which the data source is a derived GDP deflator or Average Weekly Earnings data are those for which data need to be interpolated to quarterly.

- National Accounts: PFCE
  This was the data source for some industries in the services sector such as Education, Health, Financial services, Dwelling rent, and Entertainment. Quarterly current and constant price expenditure data are used to derive a deflator. In many cases this occupies the middle ground between producer and consumer price data, as the explicit deflating of the current price data makes adjustments to better reflect the true cost to the producer of providing a service.

- CPI
  This was the data source for service industries such as Communication, Retail trade, and Mechanical repairs. The data correspond to consumer prices, and so incorporate import prices. The data are available on a quarterly basis.

- National Accounts: Private Gross Fixed Capital Expenditure
  This was the data source for the construction industries. Quarterly current and constant price gross product data are used to derive a deflator.

- Average Weekly Earnings (AWE)
  This was the data source used for Repairs n.e.c. An annual wage rate for office machine repairers was constructed from earnings and hours worked data, to be used as a proxy for price movements in this industry.

The key concern in matching price data to each of the 109 input-output industries was obtaining source data which provided a good measure of price movements within that industry. It was particularly important that the coverage of the source price data closely matched the coverage of the input-output industry, and the general compatibility of the IOIC and ASIC classifications was useful in this regard. Also important was that the data source corresponded to the price received by domestic producers for their output, and that a continuous data source was available over the entire period under consideration.

Ideally, a separate price index would be available for each industry. However, this is not always possible, and for many industries a weighted average of several price indexes needs to be constructed, while elsewhere one price index will be used to represent price movements in several input-output industries. Most of the data required are fairly disaggregated. We have been able to obtain access to a great deal of unpublished price data. However, some of this data is confidential. To protect confidentiality we cannot release price data corresponding to a number of the 109 level industries.[13] However, confidentiality does not restrict the publication of the sectoral price indexes or the composite price indexes at the 28 industry level.

Source data are not always available on a consistent basis over the entire period required. For example, many currently produced CPI series do not extend back into the 1970s whereas some originally produced series do not continue beyond the 1980s. Wherever possible one data source has been maintained over the entire period. This may sacrifice coverage over part of the period. All data sources adopted are still being produced, enabling the continued production of these sectoral price indexes into the future.

The classification systems used by the data sources do not always correspond to the IOIC. Because of the different classification systems, in some cases the chosen price index only approximately matches the coverage of the input-ouput industry it is meant to represent. Data are not always available on the preferred conceptual basis. This problem has been discussed in more detail previously in Section 6.1.1. In addition, data are not always available at a quarterly (or monthly) frequency. In particular, for many service industries price data are only available annually. Given the outlined problems, it is often necessary to make a subjective judgement on what is the preferred data source out of several far from ideal alternatives.

Dwyer's (1992) matching of data sources to input-output industries is taken as the starting point in this exercise, and improvements are made where possible. While substantial revisions are made to this base, it is not expected that these will have a major effect on the final tradable and

[13] Price indexes for the input-output industries 11.01 and 11.02 (Ferrous metal ores and Non-ferrous metal ores respectively) cannot be released due to confidentiality. It is possible that in future other price indexes may become confidential if some firms depart from an industry leaving one or two dominant suppliers in that industry.

non-tradable price indexes. Where changes are made it is often because it has been possible to obtain data that were not previously available. In these cases, the data source generally remains the APMI. Therefore, the price series used are likely to be highly correlated with those of Dwyer, and major changes should not be evident in the composite price indexes as a result of changing the precise data source.

In some cases a closer matching of price data to industry has been achieved, or an alternative data source that more closely corresponds to the concept of the price received by domestic producers for their output has been used. An outline of the changes made to the matching achieved by Dwyer (1992) is provided below:

- For the agricultural sector (01.01, 01.02, 01.03, 01.04, 01.05, 01.06 and 02.00), the data source is ABARE rather than MUMI. The ABARE data do not just reflect purchases by the manufacturing industry, the correspondence to input-output industries is no worse than that of MUMI, and data are readily available over the entire period. For commodities such as milk and eggs where sales to manufacturers are a small part of total output, the weight assigned to the product by MUMI is not representative of the true weight.
- Wherever possible a continuous data series is used. This is relevant to the choice of data source for the Fishing and hunting (04.00) and Mechanical repairs (49.01) industries.
- In the mining industries (11.01, 11.02, 12.00, 14.00 and 16.00) it has been possible to obtain more disaggregated price data and to construct weighted averages which have a better correspondence to the coverage of the input-output industry. For 11.01, 11.02 and 12.00 MUMI data have been combined with Export Price Index data to obtain a better measure of prices received by domestic producers for their output, whether sold locally or exported.
- In the manufacturing industries a substantial number of changes have been made. For several input-output industries (e.g. 32.02 Ships and boats, 21.08 Food products n.e.c., 34.05 Manufacturing n.e.c.) a much closer coverage has been achieved because previously unavailable data have been obtained. Most of the changes made are of this type.
- For the construction industries (41.01 and 41.02), a data source that better reflects output prices, rather than the prices paid for inputs into construction, has been used.
- For some service industries, a data source that is believed to be a better proxy for price movements within that industry has been used. This is the case for 37.01 Water, sewerage and drainage, 61.06 Residential property operators and 49.02 Repairs n.e.c.
- For the Road transport and Air transport industries (51.01 and 54.01) a price index has been constructed which is more specifically related to the sector under consideration, rather than using an aggregate price index. Similarly, for the industries, 81.01 Health, 82.01 Education, 91.01 Entertainment, 92.01 Restaurants, hotels and clubs and 93.01 Personal services, a price index which is more specifically related to the relevant industry is used in preference to the industry gross product deflator.
- For the finance and insurance industries (61.01, 61.02, 61.03, 61.04) the PFCE implicit deflator for financial services has been used rather than the industry gross product implicit deflator. This change was made because evidence suggested that problems in measuring constant price gross product caused distorted estimates of price change for this industry.
- ANZSIC-based industry gross product implicit price deflators are used for the service industries 52.01, 53.01, 57.01, 61.05, 71.01, 72.01, and 83.01. Their coverage differs somewhat from the ASIC-based implicit price deflators used by Dwyer which cannot be compiled beyond 1992–93. The ANZSIC-based deflators are not available prior to 1982–83 and so are spliced to the ASIC-based deflators. While the coverage of the price indexes is no longer continuous, the introduction of ANZSIC has resulted in price indexes for industries 61.05 Property and business services and 83.01 Community services which are more narrowly defined and correspond more closely to the relevant input-output industry.

## 6.2 Time Series of Weighting Data

The output of each tradable and non-tradable industry as a share of sectoral output provides a set of weights that can be applied to the 109 industry level price indexes to form sectoral price indexes. The precise method by which these weights are applied to the price data will depend on which method of index construction is chosen.

Industry gross product estimates are available for the years in which input-output tables have been released (1974–75, 1977–78 through 1983–84, 1986–87 and 1989–90). These output data combined with the information previously derived as to the profile of the importable, exportable, tradable and non-tradable sectors, can be used to construct weights at each of these points in time. For each of the five sectors (importable, exportable, tradable, non-tradable and overall) a set of 109 industry weights has been estimated for each of the years in which an input-output table was released. These weights represent the share of output an industry contributes to total sectoral output.

This discussion refers to producer price weights only: that is, weights calculated according to output valued at producer prices rather than factor costs. It is these producer price weights that are to be applied to price data when calculating composite sectoral price indexes. The output and weighting data used in this procedure reflect the revised treatment of the wholesale industry. That is, the wholesale industry is proportionately allocated between the exportable and non-tradable sectors over the entire period. It does not shift between these two sectors over time.

Consider, for example, the exportable sector. Most industries contribute no output to the exportable sector over the entire period considered. Therefore the weighting time series for these industries relative to the exportable sector will equal zero at all times. However, if an industry is classified as exportable at any point in time, it is necessary to construct a time series of weights for that industry relative to the exportable sector.[14] This weighting time series can then be applied to the price data for the industry in the compilation of a price index for the exportable sector. A number of issues arise when constructing time series of weights, and these are discussed in the following sections.

### *6.2.1 Constructing Weights for 1976 – 77*

For all input-output table release years, except 1974–75, the weight an industry contributes to a sector is simply constructed as industry gross product divided by sectoral gross product. The 1974–75 input-output table does not correspond very well with later tables due to substantial classification changes. In order to construct composite price indexes from March 1977 it is necessary to have weights information for all of 1976–77. This could be obtained by backcasting weights from 1977–78, or by using information from the 1974–75 tables and interpolating. In order to make the most use of the price data and obtain composite price indexes over a longer period, it was decided to incorporate the 1974–75 data in constructing weights.

By using industry gross product estimates for 1974–75, and interpolating to obtain output estimates for 1976–77, weights can be obtained for 1976–77. Due to the unknown impact of the classification changes on the 1974–75 table, the industry profile of sectors was assumed to be the same as in 1977–78. The profile implied by the 1974–75 input-output table was not used to calculate sectoral gross product. Only changes in the gross product of contributing industries will affect sectoral gross product over this period, since the industry profile remains unchanged. As we are only interested in obtaining estimates of 1976–77 output, the industry profile of 1977–78 is more relevant than that of 1974–75.

The classification changes are also likely to impact upon industry gross product estimates. However, rarely did the 1974–75 weights differ substantially from the 1977–78 weights. The interpolated weights for 1976–77 are therefore quite close to those for 1977–78, and appear to correspond well with weights from later tables. The additional industry in the 1974–75 tables is excluded from the analysis.

[14] Whether an industry is classified as exportable has been determined in Section 4. The classification procedure is outlined in Section 3.

### 6.2.2 Constructing Weights after 1989 – 90

The most recent input-output table available when undertaking this analysis was the 1989–90 table. No more recent information as to changes in the output of the 109 input-output industries was available.[15] Initially, sectoral price indexes were calculated with industry gross product, and hence the weighting pattern, assumed constant after 1989–90.

This constitutes a preliminary set of results only. The movements of the composite price indexes in recent years must be used with caution. Specifically, the sectoral price indexes do not capture any change in the composition of the sector which may have occurred since 1989–90. However, as prices have not exhibited dramatic movements over the last few years, and because the composite price indexes are fairly insensitive to small changes in weights, the assumption of constant weights is not expected to have a large impact upon the price indexes for the tradable and non-tradable sectors.

The 1992–93 input-output tables were released in September 1996. The results in this paper have not been updated to reflect this new data. With the new role of input-output tables in compiling the National Accounts, this problem is expected to be partly overcome due to the more regular and timely release of input-output tables.

### 6.2.3 Compiling Quarterly Weighting Time Series

The weights calculated from the input-output tables are available only annually or occasionally triennially. When constructing chain price indexes it is desirable to have weights on at least an annual basis. As the decision was made to construct chain indexes with quarterly rather than annual linking, it is necessary to have quarterly data on weights. The weights need to be interpolated in some way to obtain quarterly weighting values. The use of interpolated quarterly weights rather than the annual average smooths the effect of shifting industries on weighting patterns and the composite price indexes.

An interpolation method in which the average of the quarterly weights equals the annual weight is desirable. Thus if the weight of industry 01.01 to total output in 1977–78 is 5%, the interpolation method should result in values for September 1977, December 1977, March 1978 and June 1978 which average 5%. It was necessary to first interpolate to annual to fill in the missing values, and then interpolate to quarterly. The cubic spline interpolation method was used to produce a quarterly weighting time series from the annual and triennial output data.

To be consistent with the weights interpolation, where it was necessary to interpolate annual price data to quarterly, the linear trend interpolation method was used. This produces very similar results to cubic interpolation, is simple to implement, and ensures the quarterly values of the price index average to the annual value. It is also desirable that all interpolated weights series sum to one at any point in time. To ensure summation of weights to unity, output rather than weights data was interpolated. The cubic interpolation method does not necessarily maintain summation of weights to one, once adjustments are made to remove negative values.[16]

The following procedure was adopted for the importable, exportable and non-tradable sectors. The interpolated output of an industry was divided by total sectoral output (the sum of all interpolated industry output for that sector) to obtain quarterly weights values. The sum of all interpolated industry output for a sector only differed slightly from total sectoral output interpolated directly. Thus weights estimates were not noticeably altered by the choice of this procedure. As sectoral output is calculated as the sum of interpolated industry output, the sum of the 109 industry weighting time series for a sector will equal one at all times.

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[15] Treasury have constructed estimates of the input-output table for 1990–91. These estimates have not been incorporated into this project due to substantial conceptual differences and the fact that two components of industry gross product were not constructed.

[16] The main problem with the cubic and linear interpolation procedures is that negative interpolated output values are regularly obtained. When an industry moves out of a sector the output data for the year takes a value of zero, and the interpolated observations will contain some negative values. These values are quite small in magnitude and average zero over the year. Nevertheless they do not make sense conceptually and so all four quarterly observations for that year are set to zero.

Although the annual output data were set to be constant after 1989–90, when interpolated to quarterly, minor oscillations were always observed around this constant value. However, when converted to weights these oscillations were not significant, and are unlikely to influence the estimates for the sectoral price indexes.

For the importable, exportable and non-tradable sectors, 109 quarterly weighting series are calculated according to the procedure outlined above. However, the weighting series for the tradable and overall sectors are not created in this manner. Tradable output for any industry is calculated as the sum of interpolated importable and exportable output. Overall output is calculated as the sum of interpolated importable, exportable and non-tradable output. Weights series can then be calculated for each industry by dividing the industry's tradable (overall) output by the total tradable (overall) output.

In order for the composite price indexes to be consistent in aggregation it is necessary that the interpolated weights series be additive. After the adjustments to ensure non-negativity are made this property of additivity does not hold. Thus if industry weights for the tradable sector were calculated according to the procedure outlined for the importable, exportable and non-tradable sectors, they will not be equal to industry weights for the tradable sector calculated by summing interpolated (and adjusted) importable and exportable output and then calculating weights.

The lack of additivity in the composite price indexes is a serious problem and would destroy the in-built checks as to accuracy which flow from the consistency in aggregation property of the Laspeyres and Paasche indexes. For this reason it was decided to follow the bottom-up procedure in which tradable output is calculated by directly aggregating interpolated importable and exportable output. The resulting quarterly output series are additive, but are different to those obtained if tradable (or overall) output was directly interpolated. The average for each input-output table year is identical under each method. It is only the interpolated quarterly values which differ depending on the method adopted.

The method adopted produces a less smooth weights pattern for industries which shift between sectors over time. This is a consequence of the adjustments made to ensure an output value of zero for a year corresponds to a weight of zero for all quarters in that year.[17] The interpolation procedure provides values which average to zero but the cycles can be quite large. Removing these cycles can lead to sharp changes in the weights series for shifting industries. However, the annual average will remain unchanged. The less smooth weighting pattern may be a problem when looking at very small 28 industry level composite indexes (e.g. forestry, fishing and hunting) which contain shifting industries. The sectoral price indexes are not particularly sensitive to the small weight changes that adopting this alternative procedure involves. It appears this lack of smoothness in the weights for the shifting industries is the price paid to achieve additivity.

Interpolated weights series were also calculated for importable and exportable output relative to tradable output and for the output of each sector relative to overall output. These aggregate series utilise the quarterly series for sectoral output which have been used in calculating the industry weights to sector series. The aggregate weighting time series are to be used to check that the importable and exportable price indexes combine to equal the tradable price index, and that the importable, exportable and non-tradable indexes combine to equal the overall price index.

At the 28 industry level it is necessary to calculate weighting time series relative to overall output. These can be compiled by aggregating the 109 industry level weighting time series. The 28 aggregate industry price indexes should also combine to equal the overall price index.

[17] A possible alternative would be to not make adjustments for the cycles around zero. This would reflect the time-lapse inherent in the movement of an industry from one sector to another. The disadvantage would be the large amount of small negative weights.

## 6.3 Choosing a Price Index Formula

The issue to be considered in this section is the method by which the disaggregated price and weighting data will be combined to produce the final price indexes for the tradable and non-tradable sectors. There are a number of possible price index formulae which can be used for this purpose.

The choice of a price index formula for measuring the price of tradable and non-tradable goods in Australia is examined in Johnson (1996). As well as specifically examining the choice of index formula in the context of tradables price indexes, a survey of the theoretical and empirical literature relating to price index formulae is provided. In this section, only a brief outline of the relevant issues will be provided; for a detailed discussion please refer to Johnson (1996).

It is in the construction of composite price indexes from the disaggregated price data that the choice of index number formulae becomes relevant. As discussed in Section 6.1 the primary concern when matching price data to industry was to obtain a close correspondence between the coverage of the price index and the coverage of the industry. Ideally the price index would be valued on the same producer price basis as the output of the industry.

The type of index represented by the data source could only be a secondary concern in matching price data to industry and was severely constrained by the availability of data. While it would be desirable for all source price data to be based on the same index formula, we can only work within the limitations of the data which are available.[18]

The Laspeyres, Paasche, Fisher, Tornqvist and Vartia price index formulae were considered, on both a direct and chained basis. The above formulae are detailed in Johnson (1996); the chained Tornqvist and direct Laspeyres price index formulae are outlined later in this section.

The importance of the choice of price index formula is dependent on the extent of the index number spread which results from the fact that alternative formulae produce price indexes which diverge over time. If accuracy in measurement is required it is important to know whether the choice of formula alone could be responsible for much of the observed change.

There is no single index formula which can be said to be preferable in all circumstances and so it is necessary to relate the choice to the purpose for which the index is being compiled.

A number of factors entered into the final choice of the preferred price index formula for use in measuring the price of tradables and non-tradables in Australia. These factors are examined in Johnson (1996) and can be summarised as follows:

- availability of data required to compiled price indexes using alternative formulae;
- properties of data, especially volatility or seasonality of price and weighting data;
- theoretical properties of the alternative price index formulae;
- empirical evidence as to the properties of the alternative formulae;
- evidence of a quantitative analysis of the impact of the choice of price index formula on measuring price movements for the tradable and non-tradable sectors;
- recommendations of the System of National Accounts, see United Nations (1993); and
- user requirements.

[18] Generally the price indexes for the 109 industries are of the direct Laspeyres form. However, for some of the service industries, implicit GDP deflators, which approximate direct Paasche indexes, have been used.

The following choices were made concerning the method to be used in compiling the composite price indexes for the tradable and non-tradable sectors:

- **A chained index is preferred to a direct index, regardless of the formula chosen.** The benefits of using a chain index appear to outweigh the disadvantages, especially if the Fisher or Tornqvist formulae are used as they are less sensitive to chaining through unlike periods. Most importantly, chain indexes allow direct comparisons to be made between any two periods, whereas direct indexes only enable direct comparisons to be made between the fixed base period and any other period.[19] Additionally, the index number spread will generally be reduced by chaining, and chain indexes provide the only useful measure of long run price change when there has been considerable change in the composition of sectors. Chaining should not be used where data exhibit substantial or regular fluctuations. Despite the existence of several price series which are quite volatile, most of the component series are roughly monotonic.[20] The empirical results indicate that the data are sufficiently well-behaved for the potential benefits of chaining to be evident.

- **The chained index is to be linked on a quarterly basis rather than an annual basis.** When price data are quarterly, the price index may be chained annually if up-to-date quarterly weighting data are not available or if price and quantity data are seasonal and correlated. Since historical data are used, timeliness is not a problem. The price data used in this project are generally not seasonal.[21] The use of interpolated quarterly weights serves as an approximation to annual chaining and has the additional advantage of smoothing the impact of shifting industries. There is no reason why the composite price indexes should not be linked quarterly.

- **The Fisher and Tornqvist formulae are preferred to the Laspeyres, Paasche and Vartia formulae.** The primary reason for this choice is the minimisation of the index number spread. These formulae perform well under both the axiomatic and economic approaches to choosing an index formula. These price index formulae are superlative and symmetric and satisfy properties such as consistency in aggregation and approximate transitivity (minimisation of drifting) which are relevant to this application. These two formulae are very similar; their advantages and disadvantages tend to balance out. If a choice is to be made, the Tornqvist index is preferred for the purpose of compiling composite price indexes for the tradable and non-tradable sectors. The Tornqvist index is often preferred in economic modelling, due to its symmetric formula, Divisia nature, growth formulation and strong micro-economic justification in the context of production (Martin & Nguyen, 1989).

- **A range of price indexes are calculated corresponding to alternative formulae.** This makes the sensitivity of measures of price change to the choice of formulae more transparent, and allows users to choose the index formula most suitable for their intended use. Due to the diversity of user requirements it is unlikely that a single index formula will meet the needs of all users. The chained Tornqvist is the main index to be released and is recommended for most analysis and modelling applications. If a pure measure of the change in price is required, one that does not allow compositional changes to impact upon the measure of price change, the direct Laspeyres index would be preferred. An additional benefit of calculating price indexes using a range of formulae is the in-built checking mechanism this provides. It is only intended to release the results based on the chained Tornqvist and direct Laspeyres formulae and it is the results for these two formulae which are presented in this paper. Price indexes calculated using other formulae may be available upon request.[22]

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[19] However, the interpretation of the direct Laspeyres index as the change in the price of a fixed basket of goods and services, enables valid indirect comparisons to be made between any two periods.

[20] Agricultural, mining and food manufacturing industries exhibit significant fluctuations in prices.

[21] Only a few of the 109 industries show signs of seasonal price behaviour: this includes several of the agricultural industries and the Restaurants, hotels and clubs industry.

[22] Composite price indexes have been compiled using direct and chained Laspeyres, Paasche, Fisher and Tornqvist formulae, for the tradable, non-tradable, importable and exportable sectors and for each of the 28 aggregate industries.

To summarise, the *preferred price index formula for measuring the price of tradables and non-tradables in Australia* is the *chained Tornqvist formulae linked on a quarterly basis*. The direct Laspeyres index is also to be released for users who are interested in a measure of pure price change.

The direct Laspeyres and chained Tornqvist price index formulae are presented below. For definitions of alternative price index formulae see Johnson (1996). The definitions refer to industries rather than commodities so as to be consistent with the measurement of price change for tradable and non-tradable output. Note that the reference base for the price indexes is 1989–90 = 100.0, and 1989–90 is also the weighting base for the direct Laspeyres price index formula.

$p_{it}$ = the value the price index of the commodities produced by industry $i$ takes in period $t$

( period $t$=0 refers to the reference period and $p_{i0}$ = 100.0 for all $i$ )

$v_{it}$ = the current price value of the output of industry $i$ in period $t$

$w_{it} = v_{it} / \Sigma_i v_{it}$

= the share that industry $i$ contributes to the total value of output in period $t$

Laspeyres price index : (a) $L_t = \frac{\Sigma_i v_{i0}.(p_{it}/p_{i0})}{\Sigma_i v_{i0}}$

(b) $= \Sigma_i w_{i0}.(p_{it}/p_{i0})$

Two equivalent versions of the direct Laspeyres price index formula are provided above. The Laspeyres price index is a weighted arithmetic average of all the industry price series. This is illustrated by the Laspeyres (b) formula which is used to compile the direct Laspeyres composite price indexes presented in this working paper. The weights used correspond to the value of each industry's output as a proportion of total output, and so it can be seen that the Laspeyres (b) formula is identical to the Laspeyres (a) formula. The weights are calculated at 1989–90 and remain fixed over the entire period.

The Tornqvist price index formula is a symmetric formula which uses information on values in both the base period and the current period for weighting purposes, with equal importance being attached to the two periods. The growth rate of prices is approximated by logarithmic differences. The Tornqvist formula, and its commonly used logarithmic formulation are presented below. It is the Tornqvist (a) formula which is used to produce the results presented in Section 7.

Tornqvist price index : (a) $T_t = \Pi_i (p_{it}/p_{i0})^{\frac{1}{2}(w_{i0}+w_{it})}$

(b) $\ln T_t = \frac{1}{2} \Sigma_i \{(w_{i0} + w_{it}).\ln(p_{it}/p_{i0})\}$

Chaining can be applied to any of the index formulae which have been mentioned. The results in this working paper are compiled using the direct Laspeyres formula and the chained Tornqvist formula. The main difference between chained indexes and direct indexes is that while direct indexes simply calculate the price movement between the fixed base period and period $t$, a chained index incorporates price and weighting changes within the intervening period. In a chained index the current period is compared to the previous period for all observations, rather than comparing each period to a fixed base period. These measures of price change relative to the previous period can then be linked together to obtain measures of the change in price relative to the base period.

Consider an index $Z_{ab}$ which refers to an index of the price in period $b$ relative to that which occurred in period $a$. In such a case, the direct and chained price indexes can be denoted in the following way, regardless of which index formula is used.

Direct index : $X_{01}, X_{02}, X_{03} \ldots . X_{0k}$

Chained index : $Y_{01}, Y_{02}, Y_{03} \ldots . Y_{0k}$

$$Y_{01} = X_{01}$$

$$Y_{02} = Y_{01}.Y_{12}$$

$$Y_{03} = Y_{01}.Y_{12}.Y_{23} = Y_{02}.Y_{23}$$

$$Y_{04} = Y_{03}.Y_{34}$$

For example, consider the Tornqvist price index formula :

Direct index : $X_{02} = \prod_i (p_{i2}/p_{i0})^{\frac{1}{2}(w_{i0}+w_{i2})}$

Chain index : $Y_{02} = \prod_i (p_{i1}/p_{i0})^{\frac{1}{2}(w_{i0}+w_{i1})} . \prod_i (p_{i2}/p_{i1})^{\frac{1}{2}(w_{i1}+w_{i2})}$

These two indexes are measuring the same thing, but are likely to provide different measurements of price change between period 2 and the base period. The chained Tornqvist price index results presented in this paper are compiled according to this method. Note that the above discussion relates to a price index which is chained together every period; for example the quarterly tradables price indexes which are linked together on a quarterly basis. Alternatively quarterly price indexes may be chained together on an annual or less frequent basis.

## 6.4 Compiling Composite Price Indexes

Weighting time series and price indexes corresponding to each of the 109 input-output industries have been compiled. It is therefore possible to construct composite price indexes for the exportable, importable, tradable and non-tradable sectors and the 28 aggregate input-output industries. These are compiled with a quarterly frequency commencing in the March quarter 1977 and ending in the June quarter 1995.[23] The reference year for the price indexes is 1989–90 = 100.0.

The composite price indexes are compiled by applying the weighting data to the disaggregated price data for those industries which contribute output to a sector or aggregate industry. The precise method by which the weighting and price data are combined depends on the index number formulae applied. For the direct Laspeyres index only base year weights are used in combining the disaggregated price data. For the chained Tornqvist price index the entire weighting time series is applied to the price data.

Composite price indexes have been estimated using the Laspeyres, Paasche, Fisher and Tornqvist formulae on both a chain and direct basis. Therefore, eight composite price indexes are compiled for each sector and aggregate industry. It is only intended to release the direct Laspeyres index and the chained Tornqvist index, our recommended measure of price change.[24]

The calculation of composite price indexes allows the impact of the choice of index formula and the sensitivity of price change to this decision to be analysed. This analysis is discussed in Johnson (1996) and is briefly discussed in Section 6.3.1 of this paper. The calculation of the sectoral price indexes using a range of index formulae also provides a valuable checking mechanism. In particular, the construction of the chained Fisher index, which should be almost identical to the chained Tornqvist index, provides an important check on calculations.

The consistency in aggregation property of the Laspeyres and Paasche formulae provides a further check on the accuracy of results. The Tornqvist and Fisher formulae are approximately consistent in aggregation, with the degree of approximation being very high.

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[23] Note that at the time of compilation the annual industry GDP deflators and AWE data were only available for 1993–94 and not for 1994–95. As a result price change for the relevant industries was extrapolated for 1994–95 so that sectoral price indexes could be compiled to June 1995. All quarterly source data were available for the June quarter 1995. Except for the transport industries, all industries for which extrapolated data were used over 1994–95 belong to the non-tradable sector.

[24] Price indexes compiled using the alternative formulae may be available upon request.

Due to this property, the price index for the tradable sector compiled in the normal manner can be compared to an aggregate of the importable and exportable price indexes. When using the Laspeyres and Paasche formulae there should be no difference between the two methods of compiling a price index for the tradable sector. Similarly there should be no difference between the four methods of compiling an overall price index. These four methods are:

- direct compilation of a price index for the overall sector by application of weights to disaggregated price data for all 109 industries;
- aggregation of composite price indexes for the tradable and non-tradable sectors;
- aggregation of composite price indexes for the importable, exportable and non-tradable sectors; and
- aggregation of composite price indexes for each of the 28 aggregated input-output industries.

Theoretically, the allocation of IOIC industries to sector could also be performed at the 28 industry level, rather than the 109 industry level, and these 28 industry price indexes could be aggregated to obtain a set of sectoral price indexes. However, generally the 28 industry level price indexes will not aggregate to equal the sectoral price indexes derived from the 109 industry level data. This is because the aggregated industries may be composed of 109 level industries attributed to different sectors. The allocation of industries to sectors will differ depending upon whether it is performed at the 28 or 109 industry level. As a consequence the sectoral price indexes will also differ depending upon the level of allocation of industries to sector. The more disaggregated allocation is preferred.

An expected use of this data is in empirical work on the real exchange rate. This literature cautions against the use of the ratio of the price of tradables to that of non-tradables as a measure of price competitiveness (Martin & Nguyen 1989). This is because the prices of importables and exportables may change in terms of one another, and the method of weighting the two indexes may be arbitrary. The latter is not a problem with this dataset as the weights attributed to the importable and exportable sectors are determined in an objective manner from input-output data. Instead the literature recommends the use of the ratios of the price of importables to non-tradables and the price of exportables to non-tradables as measures of the real exchange rate. A weighted geometric mean price index, such as the Tornqvist or Fisher, is recommended by Juttner (1988). The calculation of price indexes for the subsectors, importables and exportables, is an extension upon most previous work in the field and is in accordance with the theoretical literature.

If interest in the tradable and non-tradable price indexes is sufficient, it is proposed that the composite price indexes will be updated quarterly to incorporate the source data which have been released in the preceding quarter. Historical revisions will also be reflected in the updated sectoral price indexes. As some of the source data are on an annual basis, some forecasting or extrapolation will be required in order for the estimated sectoral price indexes to be available for the previous quarter. As much of the source data are from the National Accounts, the sectoral price indexes could not be updated until at least two months after the end of a quarter.[25]

In the future new price data may become available which are an improvement upon our existing data sources. For example, the ABS is currently looking into constructing producer price indexes for certain service industries. While these data will not extend back to the beginning of our estimation period, such new data sources may need to be integrated with existing data sources.

Due to the lack of current weighting information, the composite price indexes are only provisional estimates after 1989–90. In the provisional estimates, weights are assumed to be constant from 1989–90 to the present. It will be necessary to revise the composite price indexes upon release of the input-output tables for 1992–93, with weights assumed constant after 1992–93.[26] If the sectoral profile derived from the 1992–93 tables differs substantially from the 1989–90 allocation of industries to sector, the sectoral and aggregate industry price indexes may be significantly affected by the revision.

[25] For quarters in which an input-output table is released, the industry profile of sectors and the weighting time series have to be updated as well as the price data. This will add to the time required to update the sectoral price indexes.

[26] It is expected that the input-output table for 1992–93 will be released in early 1996.

# 7. RESULTS: TRADABLE AND NON-TRADABLE PRICE INDEXES

## 7.1 Sectoral Price Indexes

### *7.1.1 Importable, Exportable, Tradable and Non-tradable Price Indexes*

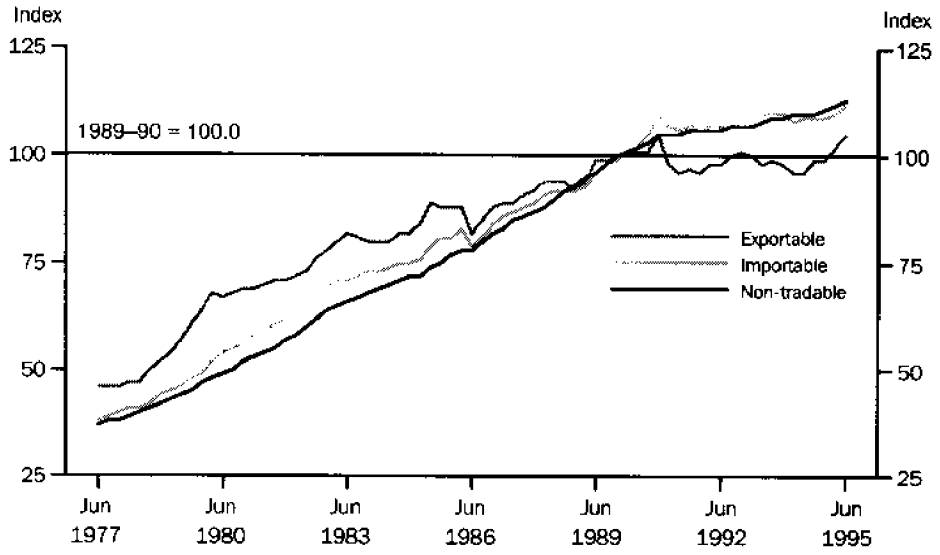
The sectoral price indexes are presented in graphical form in this section. For the numbers that lie behind these graphical representations see Appendix 3. Only sectoral price indexes compiled using the chained Tornqvist or direct Laspeyres formulae are presented.

For the reasons outlined in Section 6.3 the chained Tornqvist formula is the recommended formula. However, in circumstances where it is desirable to obtain a pure measurement of price change, unaffected by compositional changes, the direct Laspeyres formula may be preferred.

While in graphical form it may be difficult to detect differences arising from use of the two formulae, the numerical results can differ substantially when prices fluctuate. Recall that all estimated price indexes are provisional after the June quarter 1990 since weights have been assumed constant in the absence of recent input-output table data.

Graph 7.1 presents the price indexes for the importable, exportable and non-tradable sectors. It can be seen that the price index for the exportable sector is substantially more volatile than the importable and non-tradable price indexes. The non-tradable price index appears very stable over time. While exportable and importable prices undergo several periods of price falls, non-tradable prices increase in a fairly monotonic fashion.

**GRAPH 7.1 EXPORTABLE, IMPORTABLE AND NON-TRADABLE PRICE INDEXES**




While the exportable price index is the most volatile, prices in this sector have increased by less than prices have in the other sectors over the period considered. Between March 1977 and June 1995 non-tradable prices increased by more than did importable or exportable prices. The exportable price index fell substantially in the early 1990s but exportable prices have increased strongly over 1994–95. The importable and non-tradable price indexes have shown fairly small increases over the early part of this decade. In the next subsection the corresponding sectoral inflation rates will be presented.

A number of episodes can shed light on the fluctuations in the exportable and importable price indexes:

- For exportables a sharp price rise in the late 1970s and subsequent fall in 1980 is visible. This can be explained by the resources boom at this time which involved a sharp price rise for several metals. In particular, the price index for industry 11.02 (Non-ferrous metal ores) exhibits a sharp price rise and subsequent fall at this time.
- Both importables and exportables show significant price falls in 1986. This is a result of the international oil price collapse which occurred at this time. The price indexes for industries 12.00 (Coal, oil and gas) and 27.08 (Petroleum and coal products n.e.c.) show a dramatic price fall at this time. While the first of these industries is classified as both importable and exportable, the second is classified as importable only.
- The fall in the exportables price index in late 1988, following strong price growth, can in part be attributed to the collapse of the wool reserve price scheme. The price index for industry 01.01 (Sheep) falls dramatically from its peak in the June quarter 1988.
- Both the importable and exportable price indexes rise significantly in the December quarter 1990 and then decrease substantially in the March quarter 1991. The effect is particularly strong for exportables. This can be explained by the impact of the Gulf War on the price indexes for industries 12.00 (Coal, oil and gas) and 27.08 (Petroleum and coal products n.e.c.).

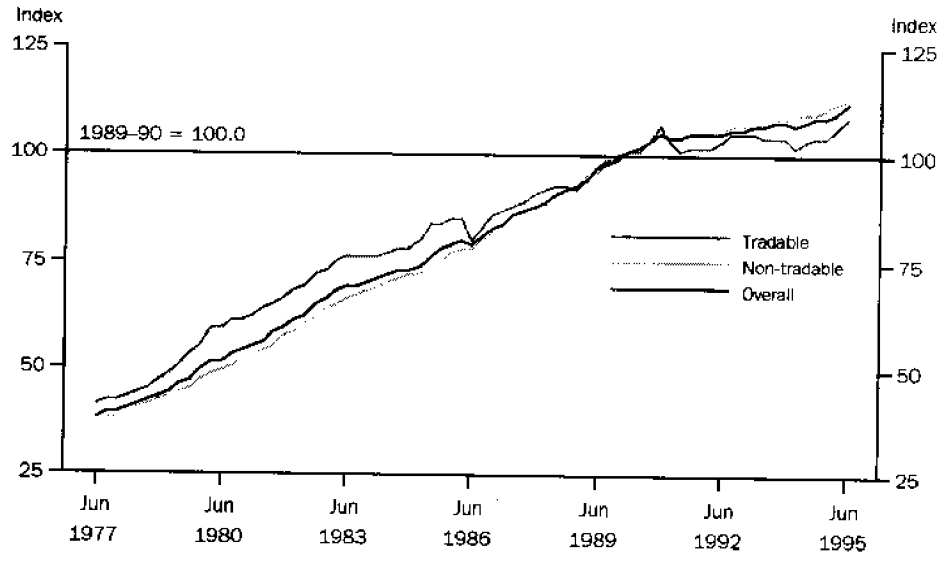
The agriculture and mining industries make up a large share of exportable output. It is these industries which are most subject to international and domestic price shocks. As a result price movements in the exportable sector are far more volatile than in other sectors.

In graph 7.2 the price indexes for the tradable, non-tradable and overall sectors are presented. The tradables price index reflects price movements in both the importable and exportable sectors, while the overall price index, reflects price movements in all sectors.

As expected the overall price index is fairly smooth over time. The tradables price index is somewhat volatile and reflects the incidents which were outlined above in respect of the importable and exportable price indexes.

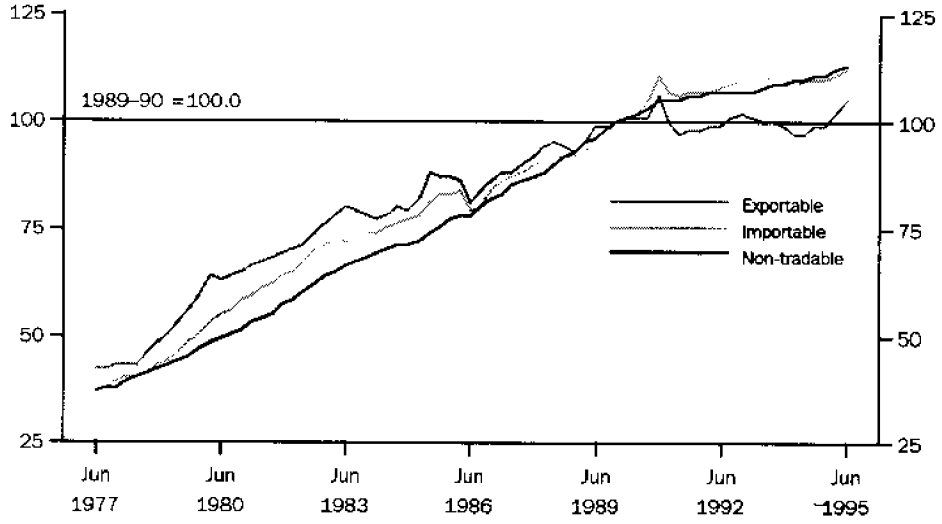
Over the period March 1977 to June 1995 the price of tradables has risen by less than the non-tradable price index. Since 1990 non-tradable prices have increased more than tradable prices, although tradable prices have increased significantly over 1994–95.

**GRAPH 7.2 TRADABLE, NON-TRADABLE AND OVERALL PRICE INDEXES**



Graph 7.3 presents the price indexes for the importable, exportable and non-tradable sectors compiled using the direct Laspeyres formula rather than the chained Tornqvist formula. There are no major differences between it and graph 7.1. This indicates that the measurement of sectoral price indexes is fairly robust to both changes in weights (which the direct Laspeyres index does not reflect) and the choice of formula. However, the actual values of the price indexes compiled using the two formulae do differ somewhat as can be seen in Appendix 3.

**GRAPH 7.3 DIRECT LASPEYRES INDEXES**




### *7.1.2 Annual Percentage Growth Rate of Sectoral Prices*

In this section the annual growth rate of prices for each of the sectors is presented. This growth rate is derived as the percentage change over the financial year in the relevant sectoral price index. In graphs 7.4 and 7.5 the annual percentage change measures are based on the chained Tornqvist formula, while in graph 7.6 they are measured using the direct Laspeyres formula.

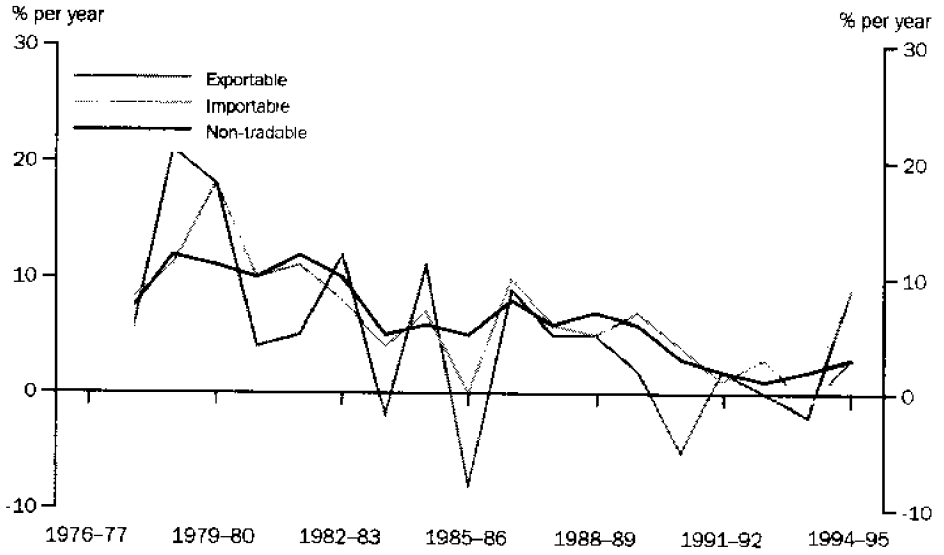
In graph 7.4 the annual percentage growth rates for the importable, exportable and non-tradable sectors are presented. The growth rate of prices is most volatile in the exportable sector. In 1978–79 the annual change in prices in this sector exceeds 20%, while at the same time the annual growth rate is about 11% in the importable and non-tradable sectors.

The exportable sector is also more likely to experience negative prices growth, such as in 1983–84, 1985–86, 1990–91 and 1993–94. Annual growth of the non-tradable price index is always positive but there is a noticeable downward trend in the observed rates over the period considered. The growth rate of the importable price index has also been much lower recently, particularly compared to the peak annual change of about 17% reached in 1979–80.

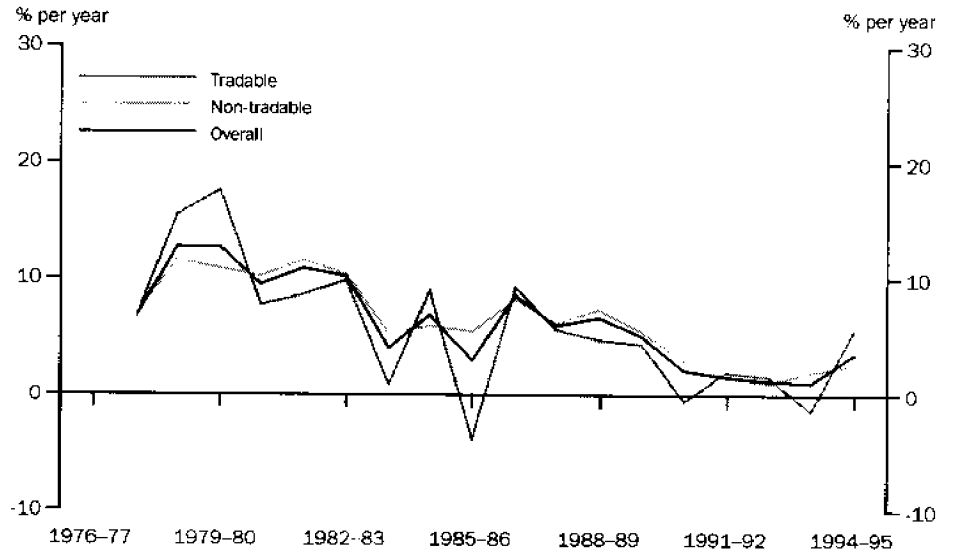
A key feature of graph 7.4 is the very low rate of prices growth for all sectors, but particularly the exportable sector, in the early 1990s. However, exportable prices grew strongly over 1994–95, while the annual growth rate of the importable and non-tradable price indexes remained low.

The annual growth rates of prices for the tradable, non-tradable and overall sectors are given in graph 7.5. As expected, the growth rate of prices is considerably more volatile in the tradable sector than in the non-tradable sector, which is not as exposed to external price shocks. The overall inflation rate has declined over the period examined, particularly since 1986–87.

## GRAPH 7.4 GROWTH RATES OF EXPORTABLE, IMPORTABLE AND NON-TRADABLE PRICES



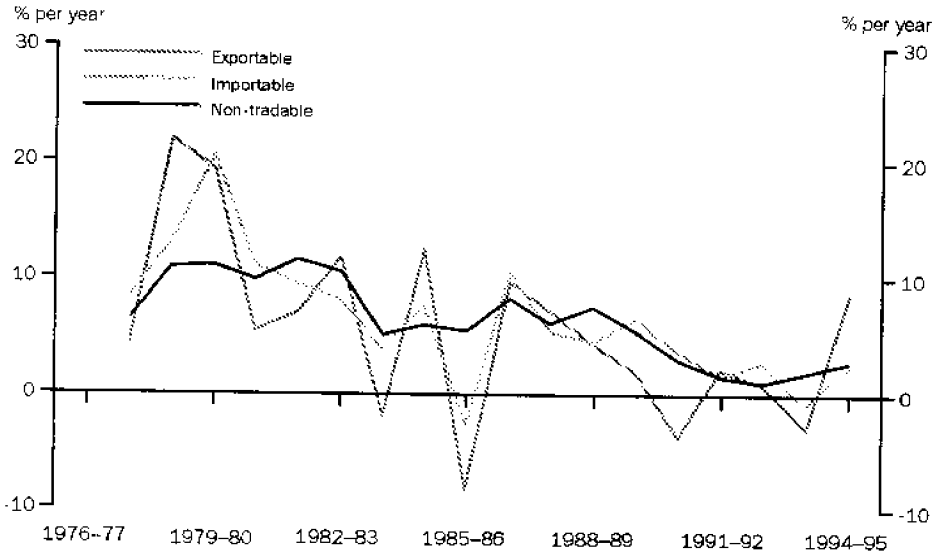

## GRAPH 7.5 GROWTH RATES OF TRADABLE, NON-TRADABLE AND OVERALL PRICES




Graph 7.6 presents the annual inflation rate for the importable, exportable and non-tradable sectors as measured using the direct Laspeyres formula rather than the chained Tornqvist formula.

The annual growth rate of prices derived using the two formulae can noticeably differ, as can be seen by comparing graph 7.4 to graph 7.6. For example, the direct Laspeyres index leads to a noticeably higher growth rate for the importable price index in 1978–79 and 1979–80 than does the chained Tornqvist index.

GRAPH 7.6 DIRECT LASPEYRES GROWTH RATES



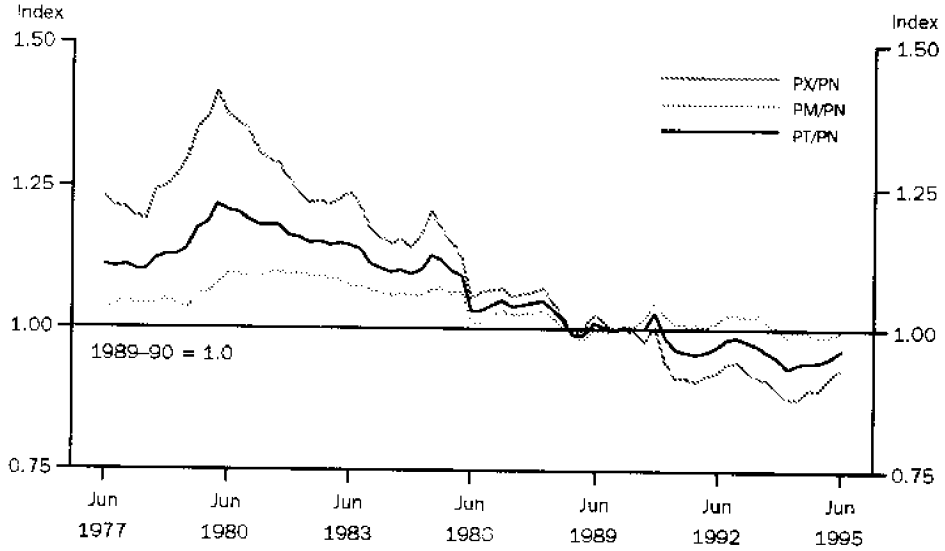

## 7.2 Measures of Competitiveness

In this section relative price indexes are constructed from the sectoral price indexes and are analysed to shed light on the competitiveness of Australia's tradable sector. As Dwyer (1992, p. 451) indicates:

> Use of these 'actual' prices rather than proxies allows for a more rigorous estimation of the internal competitiveness of Australia's traded goods sector than has previously been possible. Furthermore, it is now possible to consider the internal competitiveness of the exportable and importable subsectors.

In graph 7.7 the price indexes for the importable, exportable and tradable sectors are each expressed relative to the price index for the non-tradable sector. An increase in any of these relative prices represents a decline in Australia's competitiveness. This graph is based on the chained Tornqvist formula.

GRAPH 7.7 MEASURES OF COMPETITIVENESS (CHAINED TORNQVIST INDEXES)



Historically, the terms of trade have been quite volatile in Australia. As a consequence, the relative price of tradables to non-tradables may not be the preferred measure of competitiveness, since the price of exportables and importables may change in terms of one another, often significantly. Changes in the terms of trade will have differing impacts on the relative prices of importables and exportables, and their competitiveness. For this reason it is desirable to also examine the relative prices of these components of the tradable sector. Martin and Nguyen (1989) point out that the use of the aggregate price of traded goods is inadequate when the terms of trade are not constant and exogenous.

The relative prices which are prevailing in each of the sectors is expected to influence the allocation of resources between sectors. Using the framework, sectoral profile and price indexes outlined in this paper, the impact of relative domestic prices on the allocation of resources such as labour and capital is a topic for future analysis. These relative prices are also useful in understanding the internal competitiveness of Australia's tradable sector and how it has changed over time.

From graph 7.7 it can be seen that the level of internal competitiveness in Australia's tradable sector has improved over the period considered. The relative price of tradable to non-tradable output has shown a declining trend, and tradable output is now relatively less expensive than in the late 1970s. In particular, the exportable sector shows considerably improved competitiveness despite a great deal of fluctuation in the period examined. In contrast the internal competitiveness of the importable sector has been quite stable.

Since 1990 the relative price of exportables to non-tradables has fallen considerably to its lowest level over the period considered. The internal competitiveness of the exportable, importable and tradable sectors, is very high in historic terms. The exportable sector appears particularly competitive at present, although some of the gains have been eroded over 1994–95. While exportables comprise a smaller share of tradable output than do importables, it is the relative price movements in the exportable sector which dominate the relative price of tradables to non-tradables.

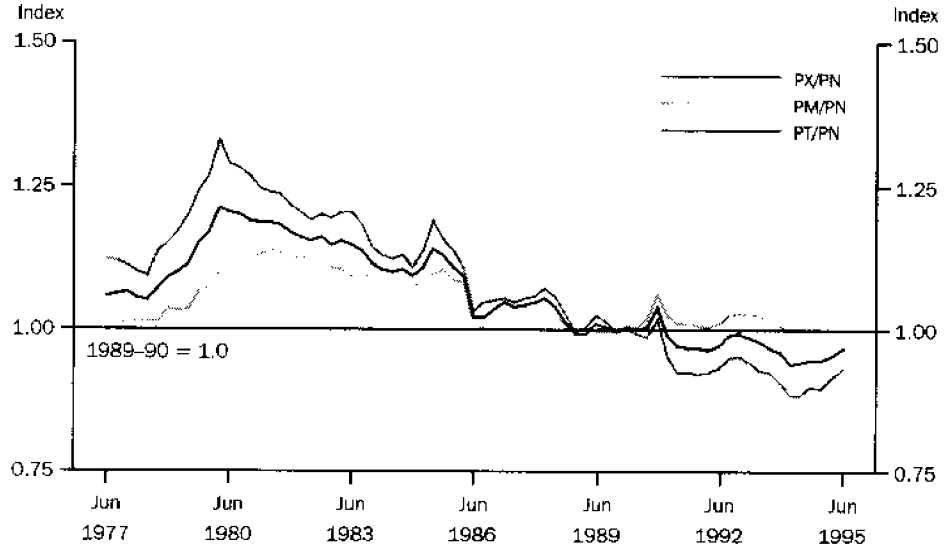
The relative prices of importables and exportables are quite highly correlated, despite the relative price of importables exhibiting far more subdued movements. In particular both relative price measures reflect the impact of the oil price fall in 1986 and the Gulf War. The relative price of importables is far less affected by the resources boom which caused prices in the exportable sector to rise sharply in the late 1970s.

It is clearly worthwhile to examine the two tradable goods subsectors as they have displayed quite different patterns in internal competitiveness over time. The relative prices of importables and exportables can change in terms of one another. Movements in the relative domestic prices of each of these subsectors may be obscured when looking solely at the relative price of the tradable sector.

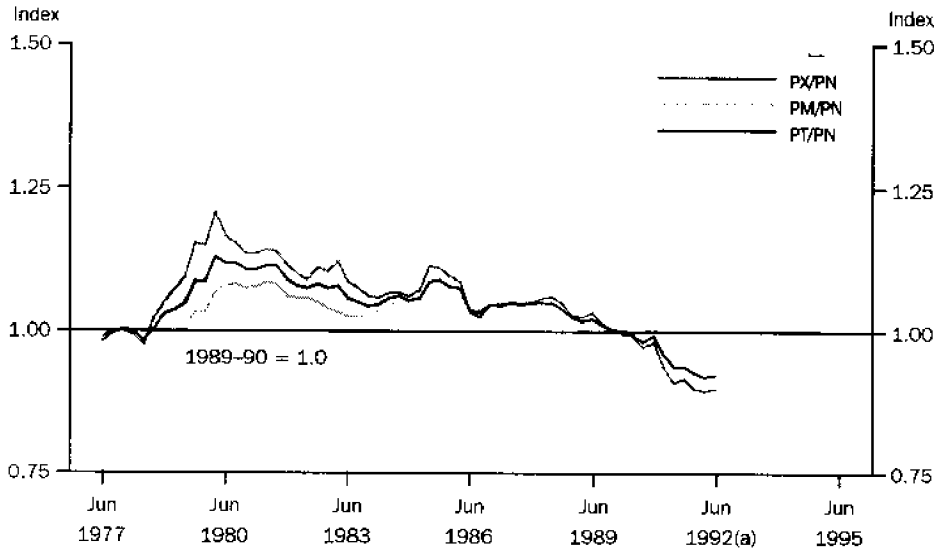
In graph 7.8 the relative prices are again presented, this time compiled using the direct Laspeyres formula. The broad conclusions made above are unchanged, indicating the robustness of these results to the choice of index formula. However some differences are observable. For example, the value represented by the 1980 peak in relative exportable prices is considerably higher when measured using the chained Tornqvist formula than it is when the direct Laspeyres formula is used.

In graph 7.9 the measures of competitiveness derived in this paper can be compared to those derived by Dwyer (1992). Dwyer's data is available up to the September quarter of 1992, and was also calculated for several years prior to the March quarter of 1977 which is the date at which our series commence. The relative price measures were constructed by Dwyer using a Laspeyres type index which was spliced backwards at intervals in accordance with the changed profiles of the sectors over time.

## GRAPH 7.8 MEASURES OF COMPETITIVENESS (DIRECT LASPEYRES INDEXES)




## GRAPH 7.9 DWYER'S MEASURES OF COMPETITIVENESS




*(a) No observations after June 1992*

Differences between the two measures could be due to differing price data sources, differing sectoral profiles, differing methodology for deriving output and weights, and the choice of index number formula. The relative price measures constructed using the direct Laspeyres formula (graph 7.8) are the most suitable for comparison with Dwyer's results which are Laspeyres type indexes.

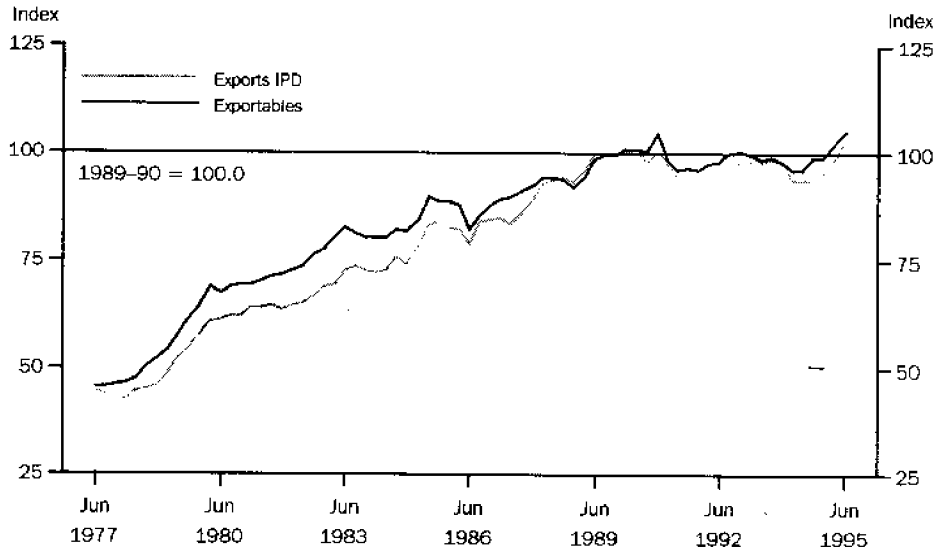
Dwyer's competitiveness measures show fairly similar movements to the measures derived in this paper, although the movements are far less exaggerated in Dwyer's series. This is particularly true for the relative price of exportables. The volatile price movements which occur in the input-output industries 12.00 (Coal, oil and gas) and 27.08 (Petroleum) have substantially less influence on the price of exportables in Dwyer's results. The greater influence of these industries in this paper is due to a change in the data source for the Coal, oil and gas industry and the special treatment of the Wholesale industry. By apportioning the output of the Wholesale industry between the non-tradable and exportable sectors, the share of exportable output which the coal and petroleum industries account for is almost doubled.

The differing treatment of the Wholesale industry accounts for much of the difference between Dwyer's results for exportables and tradables and ours. Despite the many alterations to methodology and data sources, the relative price of importables differs very little between the two sets of results.

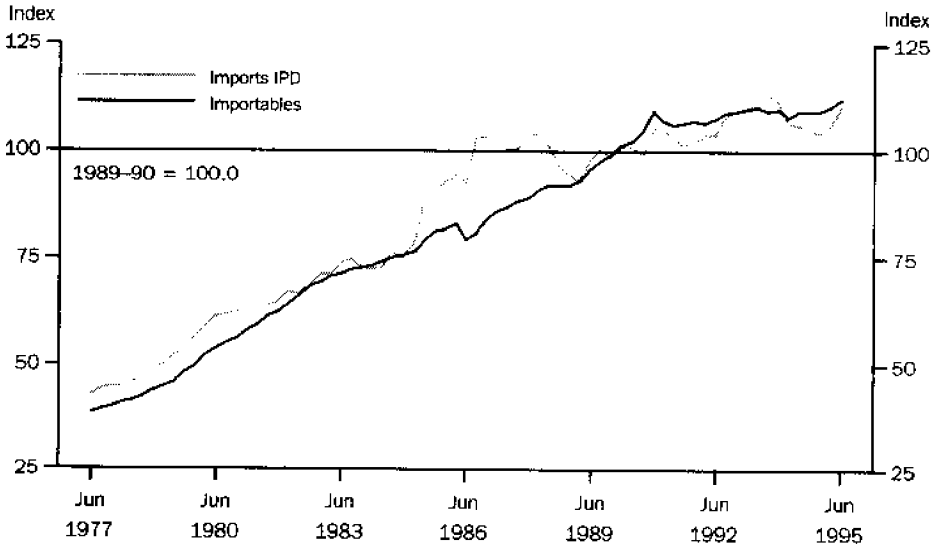
In graph 7.10 the exportables price index is compared to the implicit price deflator for exports.[27] In graph 7.11 the importables price index is compared to the implicit price deflator for imports.

It is expected that the exportables price index will be strongly correlated with the implicit price deflator for exports, as a significant share of exportable output is actually exported. It can be seen from graph 7.10 that the two price indexes are strongly correlated. Given the considerable differences in methodology and data sources this is a strong result.

**GRAPH 7.10 COMPARISON TO EXPORT PRICES**




**GRAPH 7.11 COMPARISON TO IMPORT PRICES**



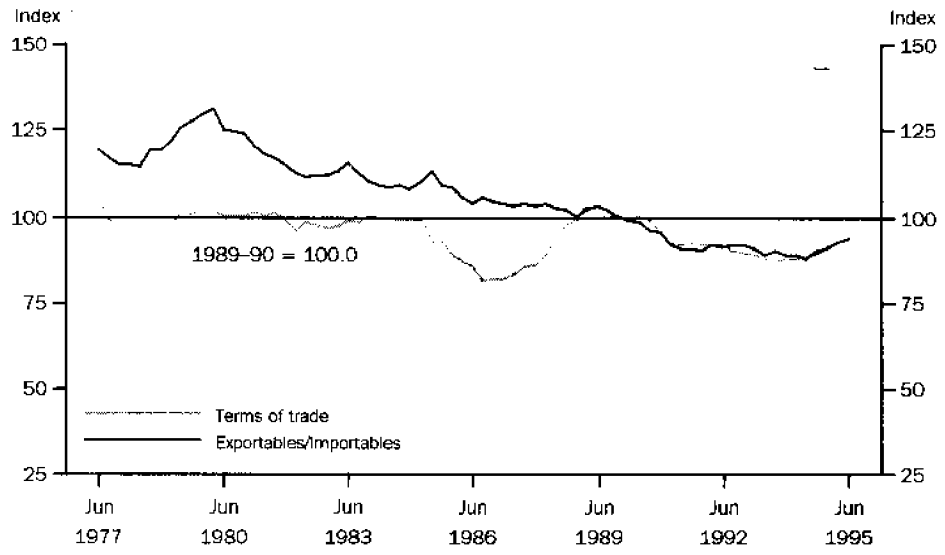

[27] The implicit price deflators for imports and exports are published in ABS Cat. no. 5206.0, table 19.

However, from graph 7.11 it can be seen that the relationship between the importable price index and the implicit price deflator for imports is less clear cut. The price of imports and the price of their domestically produced substitutes do not appear to move together. This is particularly true in the mid to late 1980s when the price of imports increases substantially and then falls, but the movements are not reflected in the price index for importables.

The ratio of the implicit price deflator for exports to that for imports is the general measure of the terms of trade. Graph 7.12 compares this general measure of the terms of trade to a measure of the price of exportables relative to that of importables (constructed as the exportables price index divided by the importables price index). This comparison reveals that there is not such a noticeable trend downward over time in the terms of trade as is observable in the relative price measure, although the terms of trade have declined substantially since 1990. The terms of trade are somewhat volatile over the period considered and fall sharply in the mid-1980s as a result of the increase in import prices.

From 1990, the two measures are strongly correlated. Before 1990, there is little correlation between the terms of trade and the relative price measure. In particular, the 1980 peak in the relative price measure is not observed in the terms of trade, nor is the 1986 trough in the terms of trade apparent in the relative price measure. This lack of correlation is largely due to the lack of correlation between the implicit price deflator for imports and the importables price index, as illustrated in graph 7.11.

**GRAPH 7.12 COMPARISON TO THE TERMS OF TRADE**




## 7.3 Price Indexes for 28 Aggregate Industries

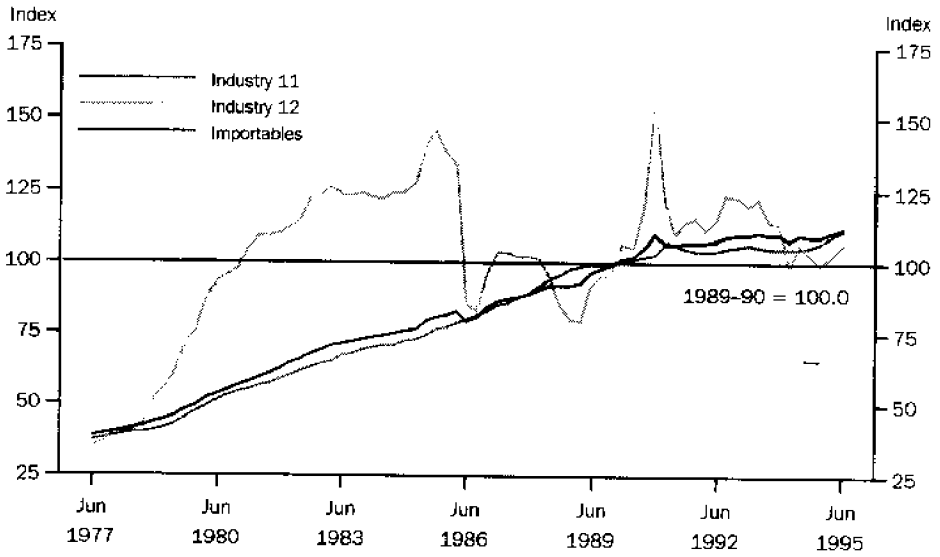
Composite price indexes were compiled not only for each of the sectors, but also for each of the 28 level input-output industries. In this section we present the price indexes for a number of the more influential of these industries. In Section 7.2 some sectoral price movements were attributed to events in particular industries. In particular the agriculture, mining and petroleum industries were considered influential. In Section 4.2 a number of industries which accounted for a large share of a particular sectors output were emphasised. Industries which contribute a large share of sectoral output or have rather volatile price movements are focused upon in this section. All charts in this subsection are compiled using the chained Tornqvist formula, as are the price indexes for all 28 level industries which are presented in Appendix 4.

Graph 7.13 and graph 7.14 present price indexes for the following industries at the 28 industry level, with the IOIC code given in brackets: Chemicals (11), Petroleum and coal products (12), Transport equipment (16), and Machinery and equipment n.e.c. (17). In these two graphs the price indexes for these four industries are compared to the price index for the importable sector.

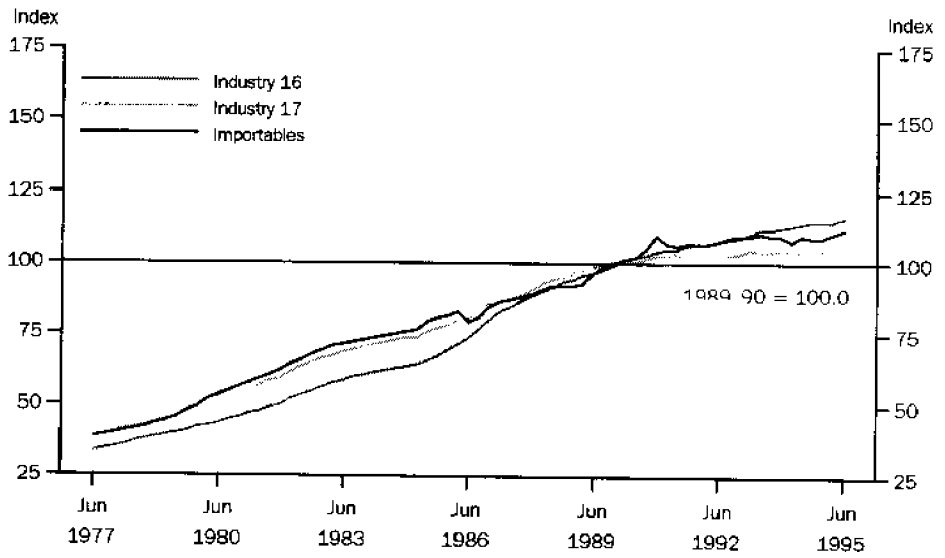
These four industries each contribute a large share of importable output and so price movements within these industries may be important in explaining movements in the price of importables. Combined, these four industries constitute around 50% of total importable output, but this share varies over time. Industries 16 and 17 each contribute about 15% of importable output, with the Petroleum and coal products industry contributing about 10% of sectoral gross product and the Chemicals industry contributing slightly less.[28]

It can be seen that the price index for the Petroleum and coal products industry is exceptionally volatile. The price index for Coal, oil and gas, which is a component of the mining industry (3), is highly correlated with this price index and also contributes to the importable sector.[29] The movements in the price index for Petroleum and coal products dominate price movements in the importable sector. The other component price indexes are generally fairly smooth over time.

**GRAPH 7.13 IMPORTANT CONTRIBUTORS TO THE IMPORTABLE SECTOR (I)**




**GRAPH 7.14 IMPORTANT CONTRIBUTORS TO THE IMPORTABLE SECTOR (II)**




[28] Note that, in general the 28 industry level industries include several 108 industry level industries, not all of which are necessarily classified to the importable sector.

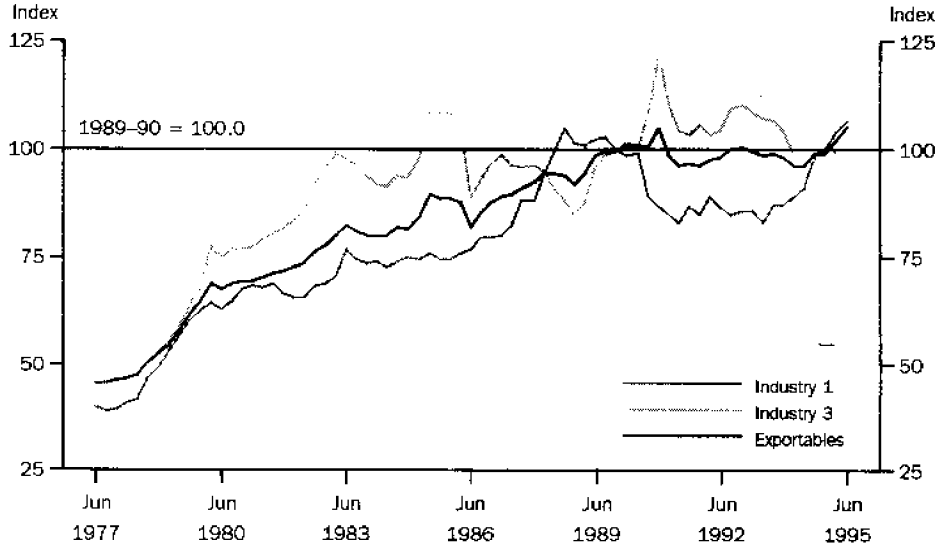
[29] See graph 7.15 for the price index for the 28 level industry Mining (3).

Motor vehicles account for the majority of the Transport Equipment industry. The price index for this industry has shown a very steady rate of growth in the 1990s, and increased sharply through 1985 and 1986. Another interesting feature is the very slow rate of price change in the Machinery and equipment n.e.c. and Chemicals industries since 1990.

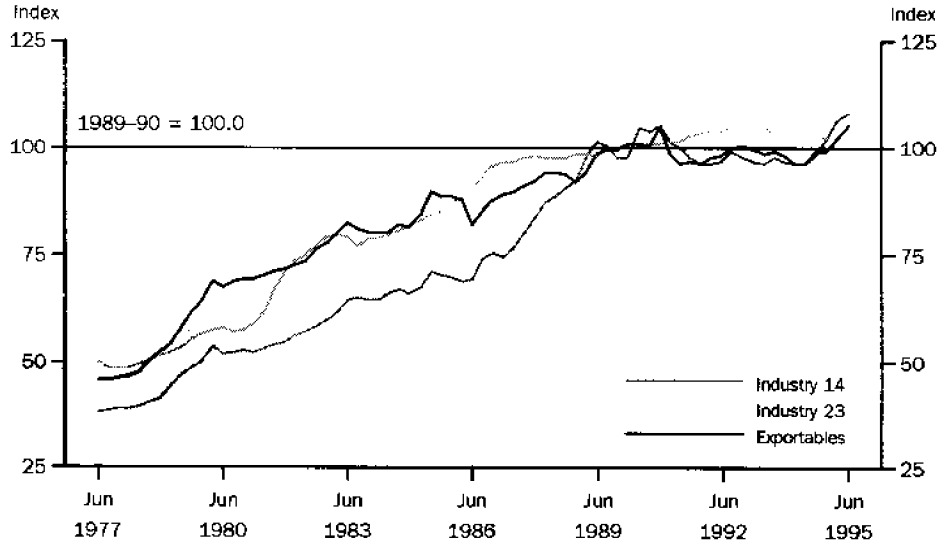
Graph 7.15 and graph 7.16 illustrate the price indexes for the following 28 level industries: Agriculture (1), Mining (3), Basic metals and products (14) and Transport, storage and communication (23), and compare these price indexes to the exportable price index.

Each of these industries are important contributors to the exportable sector. Combined they account for about three quarters of exportable output. The Mining industry in itself is responsible for up to 35% of exportable output, with the precise share varying over time. The remaining three industries each account for between 10% and 20% of exportable output.

**GRAPH 7.15 IMPORTANT CONTRIBUTORS TO THE EXPORTABLE SECTOR (I)**



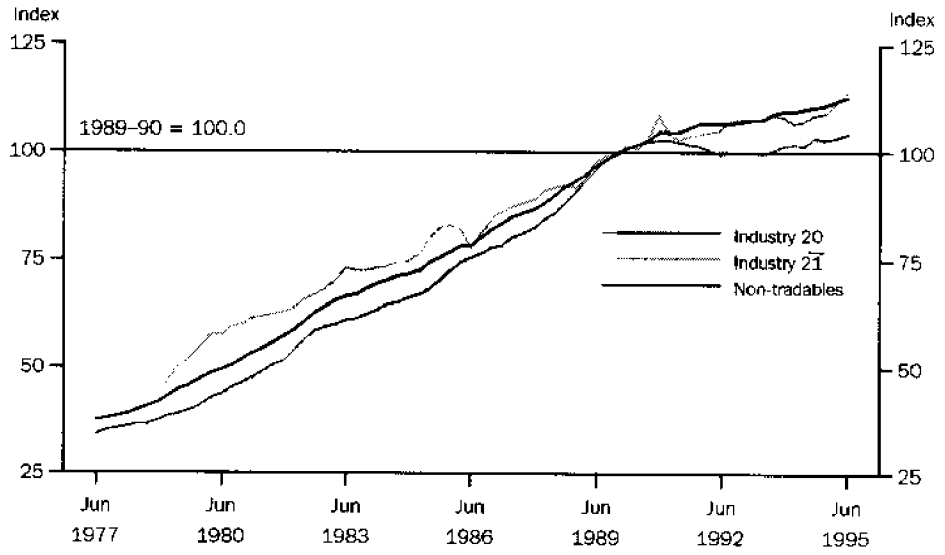

**GRAPH 7.16 IMPORTANT CONTRIBUTORS TO THE EXPORTABLE SECTOR (II)**



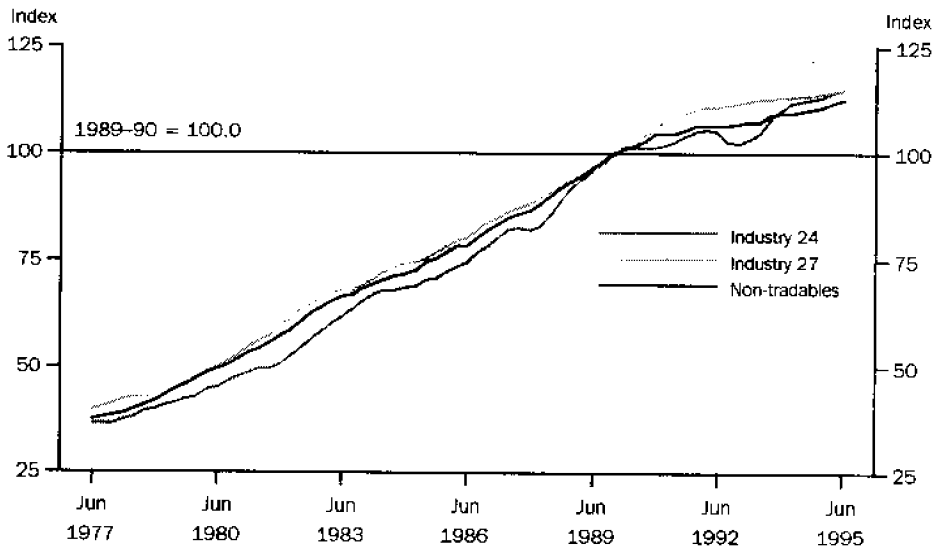
The Mining industry possesses the most volatile price index of the major exportable industries, although the price index for the Agriculture industry is also quite volatile. The price index for the Mining industry is dominated by price changes in the Coal, oil and gas component, although mineral prices are also reflected. For all four industries prices fluctuate more than for the average importable or non-tradable industry. As a consequence prices in the exportable sector are far more volatile than prices in the importable or non-tradable sectors. In the Agriculture, Mining and Basic metals and products industries a significant price decline is evident in the early 1990s. In the Agriculture industry there has been a sharp price rise over 1994–95, and a less significant price increase is also evident in the Mining and Basic metal and products industries over 1994–95.

Graph 7.17 and graph 7.18 illustrate the price indexes for the following 28 level industries: Construction (20), Wholesale and retail trade (21), Finance, property and business services (24) and Community services, education and health (27). These graphs also provide a comparison to the price index for the non-tradable sector.

**GRAPH 7.17 IMPORTANT CONTRIBUTORS TO THE NON-TRADABLE SECTOR (I)**




**GRAPH 7.18 IMPORTANT CONTRIBUTORS TO THE NON-TRADABLE SECTOR (II)**



Each of these industries makes a contribution to the non-tradable sector of between 10% and 20% of sectoral gross product. Combined they account for about 60% of non-tradable gross product, with the Wholesale and retail trade industry making the largest contribution, followed by the Finance, property and business services industry which is growing in importance. Service industries account for about 90% of non-tradable gross product.

It can be seen that the price index for the Wholesale and retail trade industry is somewhat volatile, but these price fluctuations are not large enough to be readily detected in the price index for non-tradables. The price indexes for the Construction, Finance, property and business services, and Community services, education and health industries are relatively less volatile. In particular the price index for the latter industry increases in a roughly monotonic fashion, which is typical of price indexes for industries in the non-tradable sector.

In the non-tradable sector, price decreases were observed for both the Construction industry and the Finance, property and business services industry in the early 1990s. In contrast, the price index for the Community services, education and health industry displayed a relatively high rate of growth over the same period.

The main point to arise from this analysis of the composite price indexes compiled for input-output industries at the 28 industry level, is the strong influence of fuel prices on the results for the sectoral price indexes. In particular, price indexes for industries which are important contributors to the exportable industry tend to be relatively volatile. For industries which are important contributors to the non-tradable sector, price indexes tend to be fairly stable over time.

# 8. A TRADABLES DATABASE

The ABS is considering releasing a tradables database, containing the sectoral profile, output and price index data outlined in this working paper, on a regular basis. The production and regular release of such a database is dependent on sufficient interest being demonstrated in the series compiled in this project.

A possible vehicle for releasing future updates of the tradables database is the Modeller's Database compiled by the ABS. This Modeller's Database is to contain series from the TRYM model of the Australian economy and selected NIF model series; other data of interest to economic modellers is expected to be included in the future. If sufficient interest is demonstrated, selected aggregate time series from the tradables database could be released on a quarterly basis via the Modeller's Database or other ABS publications.

If it is released, the tradables database would contain all of the data outlined in this working paper, including estimates of the following:

- industry profile of importable, exportable, tradable and non-tradable sectors over time;
- gross product of each sector over time;
- sectoral shares over time;
- price indexes for all 109 level industries (except confidential series);
- price indexes for all 28 level industries;
- price indexes for all sectors;
- measures of competitiveness; and
- detail of IOIC classification at 28 and 109 industry levels.

The composite price index and competitiveness measures would be compiled using both the chained Tornqvist and direct Laspeyres price index formulae. The price indexes would be updated quarterly, and released with a two to three month lag after the end of the relevant quarter.

There would be a major update annually with the release of the input-output tables. At this time, the industry profile, sectoral gross product, weighting and price indexes would all be updated to reflect the information contained in the current release of ABS Cat. no. 5209.0. With the new role of the input-output tables in compiling the National Accounts it is expected that those tables will be released in a regular and more timely fashion in the future.

Given the importance of the tradable/non-tradable division to the economic analysis of issues such as inflation, resource allocation and international trade flows, it is believed that a database containing the series developed in this paper would provide a valuable resource to economic modellers and analysts.

However, as stated previously, *regular production and release of the tradables database is dependent on a strong, broad demand for the product being demonstrated.*

Response to this working paper (and its predecessor No. 96/1 *Choosing a Price Index Formula*) and the *Australian Economic Indicators* (ABS Cat. no. 1350.0, October 1996) article on 'Australia's Tradable Sector' will be used to gauge the breadth and strength of demand for such a product.

*The authors would therefore like to take this opportunity to request feedback from readers.* In particular, feedback about the following issues would be much appreciated:

- whether there is demand for regular production of the tradables database (as a whole) or for specific subsets of this database (e.g. detailed industry price indexes or sectoral share estimates);
- which organisations or individuals would benefit from the regular production of this database, and for what general purposes is the data likely to be of use; and
- the methodology adopted, and any implications of this on the suitability of the data to potential applications.

All correspondence about the proposed tradables database should be directed to Leanne Johnson on Canberra (02) 6252 8015 (facsimile) or write c/- Analytical Services (W42b), Australian Bureau of Statistics, P.O. Box 10, Belconnen, ACT 2616.

# 9. CONCLUSION

Despite the importance of the tradable/non-tradable division to economic theory, there has been little empirical analysis reflecting this division due to a lack of reliable data. Goldstein and Officer (1979) have noted that 'If the various theoretical propositions regarding the distinction between the tradable and non-tradable sectors are to be subjected to empirical testing similar to that used in other areas of international economics, data will have to be developed along tradable/non-tradable lines.' This working paper has sought to address the lack of adequate data on the size, classification and prices for the tradable and non-tradable sectors of the Australian economy, using the classification system developed by Dwyer (1992) as a starting point.

The adopted methodology identifies the composition of the tradable and non-tradable sectors using an input-output framework, with industries being defined as tradable or non-tradable according to their propensity to export or compete with imports. Application of this classification system yielded estimates of the size and composition of the tradable and non-tradable sectors and price indexes for the output of these sectors.

These measures represent a departure from most previous analysis in which the classification of output as tradable or non-tradable was based on untested, a priori, reasoning. The variability in the estimated size and composition of these sectors indicates a need for greater sophistication in the measurement of sectoral output and prices than is afforded by existing proxies. The output and price measures developed in this paper have attempted to address the acknowledged weaknesses of previous measures. The adopted methodology is an improvement upon previous methods due to the use of an objective and consistent classification system, the disaggregated level of the analysis, the ability to capture changes in the composition of sectors, the breakdown of the tradable sector into its importable and exportable components, the consideration of the choice of price index formula, and the detailed matching of price data to input-output industry.

Application of a modified version of Dwyer's (1992) classification system to input-output data for Australia has revealed several important features. The size of Australia's tradable sector is significantly smaller than many previous estimates have indicated. The composition of the tradable and non-tradable sectors have changed significantly between 1977–78 and 1989–90, and the importance of the exportable and tradable sectors has increased over the past decade. The relative importance of individual industries within the tradable and non-tradable sectors has also been identified. The development of price indexes for the tradable and non-tradable sectors of the Australian economy has revealed the relative volatility of the prices of tradable (especially exportable) commodities compared to non-tradable commodities, and a significant improvement in Australia's internal competitiveness since 1980, as measured by relative domestic prices.

Valuable information has been obtained about the size, composition and price movements for the tradable and non-tradable sectors in Australia over the period 1977 to 1995. To the extent that the adopted methodology provides an accurate representation of the tradable and non-tradable sectors, the data presented in this paper can be applied in the empirical analysis of a range of topics to which the tradable/non-tradable dichotomy is relevant. Given the importance of this division to modelling the features of a small, open economy such as Australia, the development of this dataset opens up empirical research opportunities which the lack of adequate data had previously served to limit. In particular, there is considerable scope for further empirical research into the tradable/non-tradable division as it relates to the determination of international trade flows, the internal allocation of resources, the effect of exchange rate movements and the identification of the sources of inflation.

# APPENDIX 1

## TRADABLES DIVISION, 1986-87

| 1 1a | | 2 2a | | 3 | 3a | 4 | 5 |
|---|---|---|---|---|---|---|---|
| 28 level | Description | 109 level | Description | Competing imports $m | Complementary imports $m | Total Usage $m | Degree of complementary import usage % |
| 1 | Agriculture | 101 | Sheep | 0.6 | 0.0 | 3,479 | 0.0 |
| | | 102 | Cereal grains | 35.4 | 0.0 | 3,382 | 0.0 |
| | | 103 | Meat cattle | 1.0 | 0.0 | 2,481 | 0.0 |
| | | 104 | Milk cattle and pigs | 0.1 | 0.0 | 2,030 | 0.0 |
| | | 105 | Poultry | 0.1 | 0.0 | 890 | 0.0 |
| | | 106 | Agriculture n.e.c. | 389.9 | 0.2 | 4,017 | 0.0 |
| | | 200 | Services to agriculture | 8.1 | 0.6 | 1,033 | 0.1 |
| 2 | Forestry, fishing and hunting | 300 | Forestry and logging | 4.7 | 0.4 | 889 | 0.0 |
| | | 400 | Fishing and hunting | 121.4 | 0.2 | 985 | 0.0 |
| 3 | Mining | 1101 | Ferrous metal ores | 1.8 | 2.4 | 1,921 | 0.1 |
| | | 1102 | Non-ferrous metal ores | 155.8 | 2.8 | 4,724 | 0.1 |
| | | 1200 | Coal, oil and gas | 754.9 | 3.4 | 10,622 | 0.0 |
| | | 1400 | Minerals n.e.c. | 172.1 | 0.8 | 1,753 | 0.0 |
| | | 1600 | Services to mining | 45.3 | 2.9 | 1,094 | 0.3 |
| 4 | Meat and milk products | 2101 | Meat products | 57.5 | 13.3 | 7,316 | 0.2 |
| | | 2102 | Milk products | 100.0 | 4.8 | 3,500 | 0.1 |
| 5 | Food products n.e.c. | 2103 | Fruit, vegetable products | 235.6 | 3.4 | 1,524 | 0.2 |
| | | 2104 | Margarines, oil, fats | 130.9 | 1.2 | 855 | 0.1 |
| | | 2105 | Flour mill, cereal products | 29.9 | 3.8 | 1,450 | 0.3 |
| | | 2106 | Bread, cakes, biscuits | 44.4 | 2.8 | 1,981 | 0.1 |
| | | 2107 | Confectionery | 171.7 | 1.3 | 955 | 0.1 |
| | | 2108 | Food products n.e.c. | 599.4 | 134.9 | 5,281 | 2.6 |
| 6 | Beverages and tobacco products | 2109 | Soft drinks, cordials | 67.3 | 1.4 | 1,253 | 0.1 |
| | | 2110 | Beer and malt | 14.7 | 2.4 | 1,591 | 0.1 |
| | | 2111 | Alcoholic beverages n.e.c. | 210.8 | 0.8 | 934 | 0.1 |
| | | 2201 | Tobacco products | 34.8 | 2.0 | 679 | 0.3 |
| 7 | Textiles | 2301 | Cotton ginning | 72.3 | 0.8 | 1,334 | 0.1 |
| | | 2302 | Man-made fibres | 842.7 | 1.0 | 1,453 | 0.1 |
| | | 2303 | Cotton fabrics | 635.4 | 1.2 | 1,194 | 0.1 |
| | | 2304 | Wool, worsted fabrics | 104.2 | 0.6 | 415 | 0.1 |
| | | 2305 | Textile finishing | 0.0 | 0.6 | 364 | 0.2 |
| | | 2306 | Floor coverings | 121.5 | 1.0 | 736 | 0.1 |
| | | 2307 | Textile products n.e.c. | 222.7 | 0.6 | 793 | 0.1 |
| 8 | Clothing and footwear | 2401 | Knitting mills | 263.8 | 1.6 | 1,328 | 0.1 |
| | | 2402 | Clothing | 473.5 | 5.2 | 3,411 | 0.2 |
| | | 2403 | Footwear | 278.9 | 1.2 | 1,063 | 0.1 |
| 9 | Wood, wood products and furniture | 2501 | Sawmill products | 415.3 | 2.8 | 2,079 | 0.1 |
| | | 2502 | Veneers, mfd wood boards | 79.0 | 0.8 | 649 | 0.1 |
| | | 2503 | Joinery, wood products | 115.0 | 2.2 | 1,696 | 0.1 |
| | | 2504 | Furniture and mattresses | 244.6 | 3.6 | 2,339 | 0.2 |
| 10 | Paper products, printing and publishing | 2601 | Pulp, paper, paperboard | 1,167.0 | 2.8 | 2,722 | 0.1 |
| | | 2602 | Bags and containers | 67.0 | 2.0 | 1,417 | 0.1 |
| | | 2603 | Paper products n.e.c. | 74.2 | 0.8 | 613 | 0.1 |
| | | 2604 | Publishing, printing | 611.2 | 3.2 | 3,687 | 0.1 |
| | | 2605 | Printing, stationery | 67.6 | 3.8 | 3,681 | 0.1 |
| 11 | Chemicals | 2701 | Chemical fertilisers | 174.0 | 81.9 | 1,083 | 7.6 |
| | | 2702 | Basic chemicals n.e.c. | 2,156.2 | 3.7 | 5,429 | 0.1 |
| | | 2703 | Paints | 64.4 | 1.2 | 866 | 0.1 |
| | | 2704 | Pharmaceuticals | 512.5 | 2.0 | 2,148 | 0.1 |
| | | 2705 | Soap and detergents nec | 86.5 | 1.2 | 1,046 | 0.1 |
| | | 2706 | Cosmetics etc | 99.4 | 0.8 | 606 | 0.1 |
| | | 2707 | Chemical products nec | 396.5 | 1.2 | 1,252 | 0.1 |
| 12 | Petroleum products | 2708 | Petroleum, coal products | 1,433.6 | 15.9 | 11,710 | 0.1 |
| 13 | Non-metallic mineral products | 2801 | Glass and glass products | 252.6 | 0.8 | 1,030 | 0.1 |
| | | 2802 | Clay products, refractories | 361.9 | 1.6 | 1,259 | 0.1 |
| | | 2803 | Cement | 16.3 | 0.8 | 709 | 0.1 |
| | | 2804 | Ready mixed concrete | 0.0 | 1.4 | 1,109 | 0.1 |
| | | 2805 | Concrete products | 2.4 | 1.6 | 931 | 0.2 |
| | | 2806 | Non-metallic minerals n.e.c. | 123.3 | 0.8 | 743 | 0.1 |

*... continued*

## TRADABLES DIVISION, 1986-87 *continued*

| 1 | 1a | 2 | 2a | 3 | 3a | 4 | 5 |
|---|---|---|---|---|---|---|---|
| *28 level* | *Description* | *109 level* | *Description* | *Competing imports $m* | *Complementary imports $m* | *Total Usage $m* | *Degree of complementary import usage %* |
| 14 | Basic metals and products | 2901 | Basic iron and steel | 812.1 | 12.8 | 7,239 | 0.2 |
| | | 2902 | Non-ferrous metals | 214.6 | 10.0 | 7,782 | 0.1 |
| 15 | Fabricated metal products | 3101 | Structural metal products | 55.7 | 4.8 | 3,272 | 0.1 |
| | | 3102 | Sheet metal products | 166.7 | 3.4 | 2,778 | 0.1 |
| | | 3103 | Metal products n.e.c. | 832.0 | 4.8 | 3,702 | 0.1 |
| 16 | Transport equipment | 3201 | Motor vehicles | 3,877.9 | 14.2 | 12,541 | 0.1 |
| | | 3202 | Ships and boats | 292.6 | 1.6 | 1,079 | 0.1 |
| | | 3203 | Railway rolling stock | 25.7 | 0.1 | 1,123 | 0.0 |
| | | 3204 | Aircraft | 1,284.0 | 1.1 | 2,029 | 0.1 |
| 17 | Machinery and equipment n.e.c. | 3301 | Scientific equipment | 1,392.2 | 1.0 | 2,223 | 0.0 |
| | | 3302 | Electronic equipment | 4,609.4 | 3.2 | 6,678 | 0.0 |
| | | 3303 | Household appliances | 734.9 | 3.6 | 2,302 | 0.2 |
| | | 3304 | Electrical equipment n.e.c. | 1,496.1 | 4.6 | 4,322 | 0.1 |
| | | 3305 | Agricultural machinery | 174.8 | 1.2 | 528 | 0.2 |
| | | 3306 | Construction machinery | 793.0 | 1.2 | 1,394 | 0.1 |
| | | 3307 | Machinery, equipment n.e.c. | 3,600.4 | 6.5 | 7,117 | 0.1 |
| 18 | Miscellaneous manufacturing | 3401 | Leather products | 333.8 | 0.4 | 928 | 0.0 |
| | | 3402 | Rubber products | 572.6 | 48.9 | 1,565 | 3.1 |
| | | 3403 | Plastic, related products | 1,073.8 | 4.4 | 4,647 | 0.1 |
| | | 3404 | Signs, writing equipment | 129.9 | 0.4 | 503 | 0.1 |
| | | 3405 | Manufacturing n.e.c. | 654.1 | 0.8 | 1,321 | 0.1 |
| 19 | Electricity, gas and water | 3601 | Electricity | 6.7 | 2.8 | 11,509 | 0.0 |
| | | 3602 | Gas | 3.2 | 1.2 | 1,587 | 0.1 |
| | | 3701 | Water, sewerage, drainage | 3.7 | 3.0 | 3,247 | 0.1 |
| 20 | Construction | 4101 | Residential building | 0.0 | 12.6 | 13,782 | 0.1 |
| | | 4102 | Construction n.e.c. | 81.7 | 41.8 | 26,347 | 0.2 |
| 21 | Wholesale and retail trade | 4701 | Wholesale trade | 133.4 | 56.1 | 26,698 | 0.2 |
| | | 4801 | Retail trade | 0.0 | 29.1 | 23,857 | 0.1 |
| 22 | Repairs | 4901 | Mechanical repairs | 0.8 | 4.5 | 4,556 | 0.1 |
| | | 4902 | Repairs n.e.c. | ? | 1.6 | 1,946 | 0.1 |
| 23 | Transport, storage and communication | 5101 | Road transport | 1.0 | 14.0 | 10,122 | 0.1 |
| | | 5201 | Railway, transport n.e.c. | 0.0 | 3.9 | 4,049 | 0.1 |
| | | 5301 | Water transport | 237.0 | 0.0 | 2,118 | 0.0 |
| | | 5401 | Air transport | 1,395.8 | 0.0 | 6,270 | 0.0 |
| | | 5701 | Services to transport | 314.4 | 0.0 | 4,803 | 0.0 |
| | | 5901 | Communication | 524.8 | 0.0 | 8,769 | 0.0 |
| 24 | Finance, property and business services | 6101 | Banking | 4.0 | 14.0 | 10,052 | 0.1 |
| | | 6102 | Non-bank finance | 75.0 | 10.0 | 5,969 | 0.2 |
| | | 6103 | Investment | 113.0 | 4.8 | 2,136 | 0.2 |
| | | 6104 | Insurance | 283.0 | 10.2 | 2,009 | 0.5 |
| | | 6105 | Business services n.e.c. | 983.2 | 20.0 | 24,254 | 0.1 |
| 25 | Ownership of dwellings | 6106 | Ownership of dwellings | 0.0 | 0.0 | 27,634 | 0.0 |
| 26 | Public administration and defence | 7101 | Public administration | 0.0 | 139.9 | 11,947 | 1.2 |
| | | 7201 | Defence | 0.0 | 556.7 | 7,011 | 7.9 |
| 27 | Community services | 8101 | Health | 0.0 | 15.3 | 17,812 | 0.1 |
| | | 8201 | Education, libraries | 62.1 | 0.6 | 14,075 | 0.0 |
| | | 8301 | Welfare services | 39.2 | 2.0 | 10,252 | 0.0 |
| 28 | Recreational, personal and other services | 9101 | Entertainment | 120.9 | 8.6 | 7,994 | 0.1 |
| | | 9201 | Restaurants, hotels, clubs | 6.4 | 10.8 | 8,766 | 0.1 |
| | | 9301 | Personal services | 6.5 | 3.8 | 2,206 | 0.2 |
| ***Total*** | | | | 42,592.2 | 1,432.7 | 504,366 | |
| ***Average*** | | | | | | | 0.4 |

*... continued*

## TRADABLES DIVISION, 1986-87 *continued*

| 109 level | 2 | 5a Degree of import substition % | 5b Import penetration (rounded) % | 6 Importable industries | 7 Importable portion | 8 GDP(I) at factor cost $m | 9 GDP(I) at producer prices $m | 10 Importable GDP(I) at factor cost $m | 10a Importable GDP(I) at producer prices $m | 11 Exports $m |
|---|---|---|---|---|---|---|---|---|---|---|
| 101 | | 0.0 | 0 | | | 1,830 | 2,044 | | | 2,653 |
| 102 | | 1.0 | 1 | | | 1,733 | 1,733 | | | 2,089 |
| 103 | | 0.0 | 0 | | | 1,184 | 1,257 | | | 58 |
| 104 | | 0.0 | 0 | | | 1,053 | 1,093 | | | 0 |
| 105 | | 0.0 | 0 | | | 381 | 393 | | | 7 |
| 106 | | 9.7 | 10 | x | | 1,809 | 1,897 | 1,809 | 1,897 | 307 |
| 200 | | 0.8 | 1 | | | 836 | 864 | | | 16 |
| 300 | | 0.5 | 1 | | | 358 | 392 | | | 2 |
| 400 | | 12.3 | 12 | xx | 0.39 | 305 | 343 | 118 | 133 | 192 |
| 1101 | | 0.1 | 0 | | | 1,105 | 1,135 | | | 1,280 |
| 1102 | | 3.3 | 3 | | | 2,337 | 2,402 | | | 2,525 |
| 1200 | | 7.1 | 7 | | | 6,863 | 8,621 | | | 5,154 |
| 1400 | | 9.8 | 10 | xx | 0.34 | 882 | 907 | 297 | 305 | 346 |
| 1600 | | 4.1 | 4 | | | 284 | 313 | | | 8 |
| 2101 | | 0.8 | 1 | | | 1,317 | 1,379 | | | 2,537 |
| 2102 | | 2.9 | 3 | | | 653 | 739 | | | 476 |
| 2103 | | 15.5 | 16 | xx | 0.61 | 345 | 365 | 209 | 222 | 154 |
| 2104 | | 15.3 | 15 | x | | 165 | 168 | 165 | 168 | 44 |
| 2105 | | 2.1 | 2 | | | 381 | 395 | | | 174 |
| 2106 | | 2.2 | 2 | | | 782 | 859 | | | 21 |
| 2107 | | 18.0 | 18 | x | | 289 | 376 | 289 | 376 | 34 |
| 2108 | | 11.3 | 14 | xx | 0.40 | 1,088 | 1,250 | 435 | 499 | 1,129 |
| 2109 | | 5.4 | 5 | | | 318 | 483 | | | 38 |
| 2110 | | 0.9 | 1 | | | 557 | 2,178 | | | 116 |
| 2111 | | 22.6 | 23 | x | | 182 | 469 | 182 | 469 | 42 |
| 2201 | | 5.1 | 5 | | | 259 | 1,671 | | | 11 |
| 2301 | | 5.4 | 5 | | | 78 | 81 | | | 931 |
| 2302 | | 58.0 | 58 | x | | 205 | 188 | 205 | 188 | 22 |
| 2303 | | 53.2 | 53 | x | | 185 | 185 | 185 | 185 | 15 |
| 2304 | | 25.1 | 25 | x | | 102 | 89 | 102 | 89 | 5 |
| 2305 | | 0.0 | 0 | | | 92 | 95 | | | 1 |
| 2306 | | 16.5 | 17 | x | | 164 | 183 | 164 | 183 | 33 |
| 2307 | | 28.1 | 28 | x | | 199 | 214 | 199 | 214 | 17 |
| 2401 | | 19.9 | 20 | x | | 320 | 335 | 320 | 335 | 5 |
| 2402 | | 13.9 | 14 | x | | 949 | 985 | 949 | 985 | 25 |
| 2403 | | 26.2 | 26 | x | | 266 | 278 | 266 | 278 | 10 |
| 2501 | | 20.0 | 20 | xx | 0.57 | 681 | 699 | 390 | 400 | 308 |
| 2502 | | 12.2 | 12 | x | | 158 | 160 | 158 | 160 | 9 |
| 2503 | | 6.8 | 7 | | | 510 | 548 | | | 5 |
| 2504 | | 10.5 | 11 | x | | 712 | 765 | 712 | 765 | 32 |
| 2601 | | 42.9 | 43 | x | | 581 | 638 | 581 | 638 | 79 |
| 2602 | | 4.7 | 5 | | | 437 | 452 | | | 6 |
| 2603 | | 12.1 | 12 | x | | 180 | 224 | 180 | 224 | 16 |
| 2604 | | 16.6 | 17 | x | | 1,384 | 1,417 | 1,384 | 1,417 | 52 |
| 2605 | | 1.8 | 2 | | | 1,514 | 2,135 | | | 5 |
| 2701 | | 16.1 | 24 | x | | 102 | 45 | 102 | 45 | 8 |
| 2702 | | 39.7 | 40 | x | | 930 | 998 | 930 | 998 | 267 |
| 2703 | | 7.4 | 8 | | | 226 | 237 | | | 21 |
| 2704 | | 23.9 | 24 | x | | 452 | 500 | 452 | 500 | 109 |
| 2705 | | 8.3 | 8 | | | 279 | 403 | | | 25 |
| 2706 | | 16.4 | 17 | x | | 153 | 283 | 153 | 283 | 14 |
| 2707 | | 31.7 | 32 | x | | 311 | 397 | 311 | 397 | 48 |
| 2708 | | 12.2 | 12 | x | | 243 | 5,348 | 243 | 5,348 | 681 |
| 2801 | | 24.5 | 25 | x | | 317 | 363 | 317 | 363 | 35 |
| 2802 | | 28.7 | 29 | x | | 386 | 416 | 386 | 416 | 11 |
| 2803 | | 2.3 | 2 | | | 254 | 260 | | | 3 |
| 2804 | | 0.0 | 0 | | | 138 | 147 | | | 0 |
| 2805 | | 0.3 | 0 | | | 351 | 368 | | | 0 |
| 2806 | | 16.6 | 17 | x | | 236 | 244 | 236 | 244 | 25 |

*... continued*

# TRADABLES DIVISION, 1986-87 *continued*

| 2 | 5a | 5b | 6 | 7 | 8 | 9 | 10 | 10a | 11 |
|---|---|---|---|---|---|---|---|---|---|
| *109 level* | *Degree of import substition %* | *Import penetration (rounded) %* | *Importable industries* | *Importable portion* | *GDP(I) at factor cost #m* | *GDP(I) at producer prices #m* | *Importable GDP(I) at factor cost #m* | *Importable GDP(I) at producer prices #m* | *Exports #m* |
| 2901 | 11.2 | 11 | x | | 1,741 | 1,767 | 1,741 | 1,767 | 579 |
| 2902 | 2.8 | 3 | | | 1,902 | 1,950 | | | 3,748 |
| 3101 | 1.7 | 2 | | | 986 | 1,020 | | | 33 |
| 3102 | 6.0 | 6 | | | 825 | 852 | | | 181 |
| 3103 | 22.5 | 23 | x | | 1,097 | 1,313 | 1,097 | 1,313 | 102 |
| 3201 | 30.9 | 31 | x | | 1,772 | 3,219 | 1,772 | 3,219 | 564 |
| 3202 | 27.1 | 27 | x | | 371 | 396 | 371 | 396 | 91 |
| 3203 | 2.3 | 2 | | | 550 | 556 | | | 4 |
| 3204 | 63.3 | 63 | x | | 387 | 391 | 387 | 391 | 116 |
| 3301 | 62.6 | 63 | xx | 0.85 | 311 | 396 | 263 | 335 | 252 |
| 3302 | 69.0 | 69 | x | | 687 | 843 | 687 | 843 | 169 |
| 3303 | 31.9 | 32 | x | | 488 | 589 | 488 | 589 | 98 |
| 3304 | 34.6 | 35 | x | | 861 | 917 | 861 | 917 | 138 |
| 3305 | 33.1 | 33 | xx | 0.78 | 104 | 101 | 81 | 78 | 50 |
| 3306 | 56.9 | 57 | x | | 158 | 165 | 158 | 165 | 55 |
| 3307 | 50.6 | 51 | x | | 1,227 | 1,277 | 1,227 | 1,277 | 250 |
| 3401 | 36.0 | 36 | xx | 0.76 | 113 | 127 | 86 | 96 | 111 |
| 3402 | 36.6 | 40 | x | | 360 | 523 | 360 | 523 | 28 |
| 3403 | 23.1 | 23 | x | | 1,130 | 1,214 | 1,130 | 1,214 | 75 |
| 3404 | 25.8 | 26 | x | | 147 | 221 | 147 | 221 | 2 |
| 3405 | 49.5 | 50 | xx | 0.84 | 214 | 330 | 179 | 277 | 131 |
| 3601 | 0.1 | 0 | | | 5,208 | 5,388 | | | 16 |
| 3602 | 0.2 | 0 | | | 730 | 978 | | | 0 |
| 3701 | 0.1 | 0 | | | 2,736 | 2,776 | | | 4 |
| 4101 | 0.0 | 0 | | | 5,655 | 5,801 | | | 0 |
| 4102 | 0.3 | 0 | | | 12,657 | 12,978 | | | 29 |
| 4701 | 0.5 | 1 | | | 16,500 | 17,189 | | | 2,579 |
| 4801 | 0.0 | 0 | | | 13,043 | 13,684 | | | 0 |
| 4901 | 0.0 | 0 | | | 2,631 | 2,744 | | | 4 |
| 4902 | 0.0 | 0 | | | 966 | 1,012 | | | 5 |
| 5101 | 0.0 | 0 | | | 6,795 | 6,911 | | | 748 |
| 5201 | 0.0 | 0 | | | 2,463 | 894 | | | 1,385 |
| 5301 | 11.2 | 11 | xx | 0.19 | 541 | 541 | 104 | 104 | 967 |
| 5401 | 22.3 | 22 | xx | 0.44 | 2,228 | 2,303 | 979 | 1,013 | 1,752 |
| 5701 | 6.5 | 7 | | | 3,195 | 3,299 | | | 1,314 |
| 5901 | 6.0 | 6 | | | 5,347 | 5,459 | | | 409 |
| 6101 | 0.0 | 0 | | | 6,232 | 7,072 | | | 0 |
| 6102 | 1.3 | 1 | | | 4,079 | 4,554 | | | 62 |
| 6103 | 5.3 | 6 | | | 1,417 | 1,767 | | | 63 |
| 6104 | 14.1 | 15 | x | | (187) | 642 | (187) | 642 | 132 |
| 6105 | 4.1 | 4 | | | 12,903 | 13,568 | | | 654 |
| 6106 | 0.0 | 0 | | | 19,058 | 20,877 | | | 0 |
| 7101 | 0.0 | 1 | | | 7,457 | 7,456 | | | 15 |
| 7201 | 0.0 | 8 | | | 2,942 | 2,942 | | | 81 |
| 8101 | 0.0 | 0 | | | 13,171 | 13,302 | | | 0 |
| 8201 | 0.4 | 0 | | | 11,891 | 12,043 | | | 190 |
| 8301 | 0.4 | 0 | | | 6,158 | 6,237 | | | 42 |
| 9101 | 1.5 | 2 | | | 2,566 | 4,012 | | | 18 |
| 9201 | 0.1 | 0 | | | 4,611 | 4,790 | | | 0 |
| 9301 | 0.3 | 0 | | | 1,584 | 1,625 | | | 0 |
| ***Total*** | | | 51 | | 230,399 | 254,410 | 24,360 | 34,101 | 39,483 |
| ***Average*** | 13.8 | 14 | | | | | | | |
| ***Sectoral GDP share*** | | | | | | | 10.6% | 13.4% | |

*... continued*

## TRADABLES DIVISION, 1986-87 *continued*

| 2 | 12 | 13 | 14 | 15 | 16 | 16a | 17 | 17a |
|---|---|---|---|---|---|---|---|---|
| *109 level* | *Total Supply $m* | *Export orientation (rounded) %* | *Exportable industries* | *Exportable portion* | *Exportable GDP(I) at factor cost $m* | *Exportable GDP(I) at producer prices $m* | *Non-tradable GDP(I) at factor cost $m* | *Non-tradable GDP(I) at producer prices $m* |
| 101 | 3,479 | 76 | x | | 1,830 | 2,044 | | |
| 102 | 3,382 | 62 | x | | 1,733 | 1,733 | | |
| 103 | 2,821 | 2 | | | | | 1,184 | 1,257 |
| 104 | 1,690 | 0 | | | | | 1,053 | 1,093 |
| 105 | 890 | 1 | | | | | 381 | 393 |
| 106 | 4,017 | 8 | | | | | | |
| 200 | 1,033 | 2 | | | | | 836 | 864 |
| 300 | 887 | 0 | | | | | 358 | 392 |
| 400 | 985 | 19 | xx | 0.61 | 187 | 210 | | |
| 1101 | 1,904 | 67 | x | | 1,105 | 1,135 | | |
| 1102 | 4,665 | 54 | x | | 2,337 | 2,402 | | |
| 1200 | 10,585 | 49 | x | | 6,863 | 8,621 | | |
| 1400 | 1,779 | 19 | xx | 0.66 | 585 | 602 | | |
| 1600 | 1,091 | 1 | | | | | 284 | 313 |
| 2101 | 7,207 | 35 | x | | 1,317 | 1,379 | | |
| 2102 | 3,376 | 14 | x | | 653 | 739 | | |
| 2103 | 1,513 | 10 | xx | 0.39 | 135 | 144 | | |
| 2104 | 867 | 5 | | | | | | |
| 2105 | 1,391 | 13 | x | | 381 | 395 | | |
| 2106 | 1,964 | 1 | | | | | 782 | 859 |
| 2107 | 962 | 4 | | | | | | |
| 2108 | 5,409 | 21 | xx | 0.60 | 653 | 750 | | |
| 2109 | 1,264 | 3 | | | | | 318 | 483 |
| 2110 | 1,528 | 8 | | | | | 557 | 2,178 |
| 2111 | 921 | 5 | | | | | | |
| 2201 | 633 | 2 | | | | | 259 | 1,671 |
| 2301 | 1,349 | 69 | x | | 78 | 81 | | |
| 2302 | 1,440 | 2 | | | | | | |
| 2303 | 1,148 | 1 | | | | | | |
| 2304 | 423 | 1 | | | | | | |
| 2305 | 358 | 0 | | | | | 92 | 95 |
| 2306 | 731 | 5 | | | | | | |
| 2307 | 864 | 2 | | | | | | |
| 2401 | 1,427 | 0 | | | | | | |
| 2402 | 3,375 | 1 | | | | | | |
| 2403 | 1,038 | 1 | | | | | | |
| 2501 | 2,053 | 15 | xx | 0.43 | 291 | 298 | | |
| 2502 | 615 | 1 | | | | | | |
| 2503 | 1,784 | 0 | | | | | 510 | 548 |
| 2504 | 2,314 | 1 | | | | | | |
| 2601 | 2,677 | 3 | | | | | | |
| 2602 | 1,400 | 0 | | | | | 437 | 452 |
| 2603 | 601 | 3 | | | | | | |
| 2604 | 3,552 | 1 | | | | | | |
| 2605 | 3,612 | 0 | | | | | 1,514 | 2,135 |
| 2701 | 1,079 | 1 | | | | | | |
| 2702 | 5,222 | 5 | | | | | | |
| 2703 | 851 | 2 | | | | | 226 | 237 |
| 2704 | 2,118 | 5 | | | | | | |
| 2705 | 1,098 | 2 | | | | | 279 | 403 |
| 2706 | 534 | 3 | | | | | | |
| 2707 | 1,245 | 4 | | | | | | |
| 2708 | 11,848 | 6 | | | | | | |
| 2801 | 1,025 | 3 | | | | | | |
| 2802 | 1,218 | 1 | | | | | | |
| 2803 | 692 | 0 | | | | | 254 | 260 |
| 2804 | 1,085 | 0 | | | | | 138 | 147 |
| 2805 | 910 | 0 | | | | | 351 | 368 |
| 2806 | 748 | 3 | | | | | | |

*... continued*

# TRADABLES DIVISION, 1986-87 *continued*

| 109 level | 2 | 12 Total Supply $m | 13 Export orientation (rounded) % | 14 Exportable industries | 15 Exportable portion | 16 Exportable GDP(I) at factor cost $m | 16a Exportable GDP(I) at producer prices $m | 17 Non-tradable GDP(I) at factor cost $m | 17a Non-tradable GDP(I) at producer prices $m |
|---|---|---|---|---|---|---|---|---|---|
| | 2901 | 7,145 | 8 | | | | | | |
| | 2902 | 7,772 | 48 | x | | 1,902 | 1,950 | | |
| | 3101 | 3,208 | 1 | | | | | | |
| | 3102 | 2,717 | 7 | | | | | 986 | 1,020 |
| | 3103 | 3,717 | 3 | | | | | 825 | 852 |
| | 3201 | 12,358 | 5 | | | | | | |
| | 3202 | 1,068 | 9 | | | | | | |
| | 3203 | 1,091 | 0 | | | | | | |
| | 3204 | 2,053 | 6 | | | | | 550 | 556 |
| | 3301 | 2,202 | 11 | xx | 0.15 | 48 | 61 | | |
| | 3302 | 6,662 | 3 | | | | | | |
| | 3303 | 2,324 | 4 | | | | | | |
| | 3304 | 4,202 | 3 | | | | | | |
| | 3305 | 514 | 10 | xx | 0.22 | 23 | 23 | | |
| | 3306 | 1,362 | 4 | | | | | | |
| | 3307 | 7,325 | 3 | | | | | | |
| | 3401 | 964 | 12 | xx | 0.24 | 27 | 31 | | |
| | 3402 | 1,536 | 2 | | | | | | |
| | 3403 | 4,512 | 2 | | | | | | |
| | 3404 | 502 | 0 | | | | | | |
| | 3405 | 1,368 | 10 | xx | 0.16 | 34 | 53 | | |
| | 3601 | 11,458 | 0 | | | | | 5,208 | 5,388 |
| | 3602 | 1,574 | 0 | | | | | 730 | 978 |
| | 3701 | 3,226 | 0 | | | | | 2,736 | 2,776 |
| | 4101 | 13,707 | 0 | | | | | 5,655 | 5,801 |
| | 4102 | 26,762 | 0 | | | | | 12,657 | 12,978 |
| | 4701 | 26,328 | 10 | x | | 1,628 | 1,696 | 14,872 | 15,493 |
| | 4801 | 23,498 | 0 | | | | | 13,043 | 13,684 |
| | 4901 | 4,758 | 0 | | | | | 2,631 | 2,744 |
| | 4902 | 2,130 | 0 | | | | | 966 | 1,012 |
| | 5101 | 10,009 | 7 | | | | | 6,795 | 6,911 |
| | 5201 | 3,939 | 35 | x | | 2,463 | 894 | | |
| | 5301 | 2,056 | 47 | xx | 0.81 | 437 | 437 | | |
| | 5401 | 6,174 | 28 | xx | 0.56 | 1,248 | 1,290 | | |
| | 5701 | 4,890 | 27 | x | | 3,195 | 3,299 | | |
| | 5901 | 8,285 | 5 | | | | | | |
| | 6101 | 8,494 | 0 | | | | | 5,347 | 5,459 |
| | 6102 | 7,451 | 1 | | | | | 6,232 | 7,072 |
| | 6103 | 2,152 | 3 | | | | | 4,079 | 4,554 |
| | 6104 | 2,028 | 7 | | | | | 1,417 | 1,767 |
| | 6105 | 26,321 | 2 | | | | | | |
| | 6106 | 27,641 | 0 | | | | | 12,903 | 13,568 |
| | 7101 | 11,947 | 0 | | | | | 19,058 | 20,877 |
| | 7201 | 7,011 | 1 | | | | | 7,457 | 7,456 |
| | 8101 | 17,812 | 0 | | | | | 2,942 | 2,942 |
| | 8201 | 14,090 | 1 | | | | | 13,171 | 13,302 |
| | 8301 | 10,071 | 0 | | | | | 11,891 | 12,043 |
| | 9101 | 7,994 | 0 | | | | | 6,158 | 6,237 |
| | 9201 | 9,045 | 0 | | | | | 2,566 | 4,012 |
| | 9301 | 2,233 | 0 | | | | | 4,611 | 4,790 |
| | | | | | | | | 1,584 | 1,625 |
| *Total* | | 504,366 | | 24 | | 29,159 | 30,267 | 176,880 | 190,042 |
| *Average* | | | 9 | | | | | | |
| *Sectoral GDP share* | | | | | | 12.7% | 11.9% | 76.8% | 74.70% |
| *Tradable output* | | | | | | 53,518 | 64,368 | | |
| *Total output* | | | | | | 230,399 | 254,410 | | |
| *Tradable share of GDP* | | | | | | 23.2% | 25.3% | | |
| *Number of industries* | | | | | | | 64 | | |

Note: In column 6, x denotes an industry has been classified as belonging to the importable sector.
In column 14, x denotes an industry has been classified as belonging to the exportable sector.
For both columns, xx denotes an industry has been classified as both importable and exportable.

# APPENDIX 2

## INDUSTRY PROFILE OF SECTORS

| IOIC code | Industry Description | 1977-78 | 1978-79 | 1979-80 | 1980-81 | 1981-82 | 1982-83 | 1983-84 | 1986-87 | 1989-90 |
|---|---|---|---|---|---|---|---|---|---|---|
| 101 | Sheep | x | x | x | x | x | x | x | x | x |
| 102 | Cereal grains | x | x | x | x | x | x | x | x | x |
| 103 | Meat cattle | n | n | n | n | n | n | n | n | n |
| 104 | Milk cattle and pigs | n | n | n | n | n | n | n | n | n |
| 105 | Poultry | n | n | n | n | n | n | n | n | n |
| 106 | Agriculture n.e.c. | n | n | n | n | n | n | n | m | n |
| 200 | Services to agriculture | n | n | n | n | n | n | n | n | n |
| 300 | Forestry and logging | n | n | n | n | n | n | n | n | n |
| 400 | Fishing and hunting | m,x | x | x | x | x | m,x | x | m,x | x |
| 1101 | Ferrous metal ores | x | x | x | x | x | x | x | x | x |
| 1102 | Non-ferrous metal ores | x | x | x | x | x | x | x | x | x |
| 1200 | Coal, oil and gas | m,x | m,x | m,x | m,x | m,x | m,x | m,x | x | x |
| 1400 | Minerals n.e.c. | m | m,x | m | m | m | m | x | m,x | m,x |
| 1600 | Services to mining n.e.c. | n | n | n | n | n | n | n | n | n |
| 2101 | Meat products | x | x | x | x | x | x | x | x | x |
| 2102 | Milk products | x | x | x | x | x | x | x | x | x |
| 2103 | Fruit, vegetable products | m | m | m | m | m | m | m | m,x | m |
| 2104 | Margarines, oil, fats n.e.c. | m | m | m | m | m | m | m | m | m |
| 2105 | Flour mill, cereal products | x | x | x | x | x | x | x | x | x |
| 2106 | Bread, cakes, biscuits | n | n | n | n | n | n | n | n | n |
| 2107 | Confectionery | m | m | m | m | m | m | m | m | m |
| 2108 | Food products n.e.c. | m,x | m,x | m,x | x | m,x | m,x | m,x | m,x | m,x |
| 2109 | Soft drinks, cordials | n | n | n | n | n | n | n | n | n |
| 2110 | Beer and malt | n | n | n | n | n | n | n | n | n |
| 2111 | Alcoholic beverages n.e.c. | m | m | m | m | m | m | m | m | m |
| 2201 | Tobacco products | n | n | n | n | n | n | n | n | n |
| 2301 | Cotton ginning | m,x | x | x | x | x | x | x | x | x |
| 2302 | Man-made fibres | m | m | m | m | m | m | m | m | m |
| 2303 | Cotton fabrics | m | m | m | m | m | m | m | m | m |
| 2304 | Wool, worsted fabrics | m | m | m | m | m | m | m | m | m |
| 2305 | Textile finishing | n | n | n | n | n | n | n | n | n |
| 2306 | Floor coverings | m | m | m | m | m | m | m | m | m |
| 2307 | Textile products n.e.c. | m | m | m | m | m | m | m | m | m |
| 2401 | Knitting mills | m | m | m | m | m | m | m | m | m |
| 2402 | Clothing | m | m | m | m | m | m | m | m | m |
| 2403 | Footwear | m | m | m | m | m | m | m | m | m |
| 2501 | Sawmill products | m | m | m,x | m,x | m,x | m,x | m,x | m,x | m,x |
| 2502 | Veneers, wood boards | m | m | m | m | m | m | m | m | m |
| 2503 | Joinery, wood products n.e.c. | n | n | n | n | n | n | n | n | n |
| 2504 | Furniture and mattresses | n | n | n | n | n | n | m | m | m |
| 2601 | Pulp, paper, paperboard | m | m | m | m | m | m | m | m | m |
| 2602 | Bags and containers | n | n | n | n | n | n | n | n | n |
| 2603 | Paper products n.e.c. | m | m | m | m | m | n | m | m | m |
| 2604 | Publishing, printing | m | m | m | m | m | m | m | m | m |
| 2605 | Printing, stationery | n | n | n | n | n | n | n | n | n |
| 2701 | Chemical fertislisers | m | m | m | m | m | m | m | m | m |
| 2702 | Basic chemicals n.e.c. | m | m | m | m | m | m | m | m | m |
| 2703 | Paints | n | n | n | n | n | n | n | n | n |
| 2704 | Pharmaceuticals | m | m | m | m | m | m | m | m | m |
| 2705 | Soap and detergents n.e.c. | n | n | n | n | n | n | n | n | m |
| 2706 | Cosmetics | n | m | m | m | m | m | m | m | m |
| 2707 | Chemical products n.e.c. | m | m | m | m | m | m | m | m | m |
| 2708 | Petroleum, coal products | m | m | m | m | m | m | m | m | m |
| 2801 | Glass and glass products | m | m | m | m | m | m | m | m | m |
| 2802 | Clay products, refractories | m | m | m | m | m | m | m | m | m |
| 2803 | Cement | n | n | n | n | n | n | n | n | n |
| 2804 | Ready mixed concrete | n | n | n | n | n | n | n | n | n |
| 2805 | Concrete products | n | n | n | n | n | n | n | n | n |
| 2806 | Non-metallic mineral products | n | n | n | n | n | n | m | m | m |

... continued

## INDUSTRY PROFILE OF SECTORS *continued*

| IOIC code | Industry Description | 1977-78 | 1978-79 | 1979-80 | 1980-81 | 1981-82 | 1982-83 | 1983-84 | 1986-87 | 1989-90 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2901 | Basic iron and steel | x | x | x | m | m | m | n | m | m,x |
| 2902 | Non-ferrous metals | x | x | x | x | x | x | x | x | x |
| 3101 | Structural metal products | n | n | n | n | n | n | n | n | n |
| 3102 | Sheet metal products | n | n | n | n | n | n | n | n | x |
| 3103 | Metal products n.e.c. | m | m | m | m | m | m | m | m | m |
| 3201 | Motor vehicles | m | m | m | m | m | m | m | m | m |
| 3202 | Ships and boats | m | m | n | m | n | m | m | m | m |
| 3203 | Railway rolling stock | n | n | n | n | n | n | n | n | n |
| 3204 | Aircraft | m | m | m,x | m | m | m | m | m | m |
| 3301 | Scientific equipment | m | m | m,x | m,x | m,x | m,x | m,x | m,x | m |
| 3302 | Electronic equipment | m | m | m | m | m | m | m | m | m |
| 3303 | Household appliances | m | m | m | m | m | m | m | m | m |
| 3304 | Electrical equipment n.e.c. | m | m | m | m | m | m | m | m | m |
| 3305 | Agricultural machinery | m | m | m | m | m | m | m | m,x | m |
| 3306 | Construction machinery | m | m | m | m | m | m | m | m | m |
| 3307 | Machinery, equipment n.e.c. | m | m | m | m | m | m | m | m | m |
| 3401 | Leather products | m,x | m,x | m,x | m | m | m,x | m,x | m,x | m,x |
| 3402 | Rubber products | m | m | m | m | m | m | m | m | m |
| 3403 | Plastic, related products | m | m | m | m | m | m | m | m | m |
| 3404 | Signs, writing equipment | m | m | m | m | m | m | m | m | m |
| 3405 | Manufacturing n.e.c. | m | m | m | m | m | m | m,x | m,x | m,x |
| 3601 | Electricity | n | n | n | n | n | n | n | n | n |
| 3602 | Gas | n | n | n | n | n | n | n | n | n |
| 3701 | Water, sewerage, drainage | n | n | n | n | n | n | n | n | n |
| 4101 | Residential building | n | n | n | n | n | n | n | n | n |
| 4102 | Construction n.e.c. | n | n | n | n | n | n | n | n | n |
| 4701 | Wholesale trade | x,n | x,n | x,n | x,n | x,n | x,n | x,n | x,n | x,n |
| 4801 | Retail trade | n | n | n | n | n | n | n | n | n |
| 4901 | Mechanical repairs | n | n | n | n | n | n | n | n | n |
| 4902 | Repairs n.e.c. | n | n | n | n | n | n | n | n | n |
| 5101 | Road transport | n | n | n | n | n | n | n | n | n |
| 5201 | Railway, transport n.e.c. | x | x | x | x | x | x | x | x | x |
| 5301 | Water transport | m,x | m,x | m,x | m,x | m,x | m,x | m,x | m,x | m,x |
| 5401 | Air transport | m,x | m,x | m,x | m,x | m,x | m,x | m,x | m,x | m,x |
| 5701 | Services to transport | n/a | n/a | n/a | n/a | n/a | n/a | x | x | x |
| 5901 | Communication | n | n | n | n | n | n | n | n | n |
| 6101 | Banking | n | n | n | n | n | n | n | n | n |
| 6102 | Non-bank finance | n | n | n | n | n | n | n | n | n |
| 6103 | Investment | x | x | n | n | n | n | n | n | n |
| 6104 | Insurance | n | n | n | n | n | n | n | m | n |
| 6105 | Business services n.e.c. | n | n | n | n | n | n | n | n | n |
| 6106 | Ownership of dwellings | n | n | n | n | n | n | n | n | n |
| 7101 | Public administration | n | n | n | n | n | n | n | n | n |
| 7201 | Defence | n | n | n | n | n | n | n | n | n |
| 8101 | Health | n | n | n | n | n | n | n | n | n |
| 8201 | Education, libraries | n | n | n | n | n | n | n | n | n |
| 8301 | Welfare services | n | n | n | n | n | n | n | n | n |
| 9101 | Entertainment | n | n | n | n | n | n | n | n | n |
| 9201 | Restaurants, hotels, clubs | n | n | n | n | n | n | n | n | n |
| 9301 | Personal services | n | n | n | n | n | n | n | n | n |

Note: x means that an industry belongs to the exportable sector, m the importable sector, n the non-tradable sector, and n/a means that the sectoral classification is not applicable to that industry.

# APPENDIX 3

## SECTORAL PRICE INDEXES
## (Base year: 1989-90=100.0)

| Period | Chained Tornqvist Formula | | | | | Direct Laspeyres Formula | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | X | M | T | N | O | X | M | T | N | O |
| | | | | | ANNUAL | | | | | |
| 1977-78 | 46.3 | 40.2 | 42.6 | 38.6 | 39.5 | 42.8 | 39.2 | 41.0 | 38.8 | 39.4 |
| 1978-79 | 53.3 | 44.0 | 47.7 | 42.3 | 43.5 | 49.2 | 43.5 | 46.3 | 42.3 | 43.4 |
| 1979-80 | 65.1 | 50.7 | 56.6 | 47.3 | 49.5 | 60.6 | 51.6 | 55.9 | 47.3 | 49.6 |
| 1980-81 | 69.2 | 57.0 | 62.0 | 52.2 | 54.5 | 65.4 | 58.6 | 61.8 | 52.1 | 54.6 |
| 1981-82 | 72.0 | 63.2 | 67.1 | 57.7 | 59.9 | 69.4 | 64.5 | 66.9 | 57.4 | 59.9 |
| 1982-83 | 79.1 | 69.8 | 74.0 | 64.5 | 66.8 | 77.0 | 71.1 | 73.9 | 64.3 | 66.9 |
| 1983-84 | 80.2 | 72.8 | 76.1 | 68.4 | 70.4 | 78.0 | 74.1 | 75.9 | 68.3 | 70.3 |
| 1984-85 | 84.2 | 76.4 | 79.9 | 72.2 | 74.1 | 82.0 | 77.8 | 79.9 | 72.0 | 74.1 |
| 1985-86 | 86.6 | 80.9 | 83.5 | 77.0 | 78.7 | 85.0 | 82.1 | 83.5 | 76.9 | 78.6 |
| 1986-87 | 87.8 | 84.2 | 85.9 | 82.5 | 83.4 | 86.5 | 84.2 | 85.3 | 82.5 | 83.2 |
| 1987-88 | 92.9 | 89.9 | 91.3 | 87.6 | 88.6 | 92.7 | 90.2 | 91.4 | 87.5 | 88.5 |
| 1988-89 | 94.7 | 93.1 | 93.9 | 94.0 | 93.9 | 95.1 | 93.3 | 94.2 | 94.0 | 94.0 |
| 1989-90 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1990-91 | 99.9 | 106.7 | 103.4 | 104.1 | 103.9 | 101.0 | 107.1 | 104.2 | 104.2 | 104.2 |
| 1991-92 | 97.2 | 106.8 | 102.1 | 106.2 | 105.1 | 98.2 | 107.1 | 102.8 | 106.3 | 105.4 |
| 1992-93 | 99.6 | 109.6 | 104.7 | 107.1 | 106.4 | 101.0 | 109.9 | 105.7 | 107.2 | 106.8 |
| 1993-94 | 97.2 | 109.0 | 103.2 | 109.3 | 107.6 | 98.4 | 109.4 | 104.1 | 109.4 | 108.0 |
| 1994-95 | 101.1 | 110.2 | 105.8 | 111.3 | 109.8 | 101.5 | 110.6 | 106.2 | 111.5 | 110.1 |
| | | | | | QUARTERLY | | | | | |
| 1976-77 | | | | | | | | | | |
| March | 45.0 | 37.3 | 40.3 | 36.4 | 37.3 | 41.3 | 36.5 | 38.8 | 36.7 | 37.3 |
| June | 45.6 | 38.2 | 41.1 | 37.1 | 38.1 | 41.9 | 37.2 | 39.5 | 37.4 | 38.0 |
| 1977-78 | | | | | | | | | | |
| September | 45.6 | 39.0 | 41.6 | 37.6 | 38.5 | 42.2 | 38.0 | 40.0 | 37.8 | 38.4 |
| December | 46.0 | 39.9 | 42.3 | 38.1 | 39.1 | 42.6 | 39.0 | 40.8 | 38.4 | 39.0 |
| March | 46.5 | 40.5 | 42.9 | 38.9 | 39.8 | 42.9 | 39.6 | 41.2 | 39.1 | 39.7 |
| June | 47.2 | 41.2 | 43.6 | 39.6 | 40.5 | 43.4 | 40.3 | 41.8 | 39.8 | 40.3 |
| 1978-79 | | | | | | | | | | |
| September | 50.2 | 42.2 | 45.4 | 40.5 | 41.6 | 46.1 | 41.2 | 43.6 | 40.7 | 41.5 |
| December | 51.8 | 43.5 | 46.8 | 41.5 | 42.7 | 47.8 | 43.0 | 45.3 | 41.6 | 42.6 |
| March | 54.1 | 44.5 | 48.3 | 42.8 | 44.1 | 50.1 | 44.1 | 47.0 | 42.8 | 43.9 |
| June | 57.2 | 45.6 | 50.3 | 44.2 | 45.6 | 52.9 | 45.6 | 49.1 | 44.1 | 45.4 |
| 1979-80 | | | | | | | | | | |
| September | 61.0 | 47.8 | 53.1 | 45.3 | 47.2 | 56.2 | 48.2 | 52.0 | 45.3 | 47.1 |
| December | 63.9 | 49.4 | 55.3 | 46.7 | 48.7 | 59.0 | 50.0 | 54.3 | 46.6 | 48.7 |
| March | 68.4 | 52.1 | 58.7 | 48.3 | 50.8 | 64.2 | 53.0 | 58.4 | 48.3 | 51.0 |
| June | 67.2 | 53.6 | 59.1 | 49.0 | 51.4 | 63.1 | 55.0 | 58.8 | 49.0 | 51.6 |
| 1980-81 | | | | | | | | | | |
| September | 68.4 | 55.0 | 60.5 | 50.3 | 52.8 | 64.4 | 56.3 | 60.2 | 50.3 | 52.9 |
| December | 69.3 | 56.0 | 61.4 | 51.5 | 53.9 | 65.1 | 57.5 | 61.1 | 51.4 | 54.0 |
| March | 69.2 | 57.6 | 62.4 | 52.9 | 55.1 | 65.5 | 59.4 | 62.3 | 52.7 | 55.3 |
| June | 69.9 | 59.2 | 63.7 | 54.0 | 56.3 | 66.5 | 61.1 | 63.7 | 53.8 | 56.4 |
| 1981-82 | | | | | | | | | | |
| September | 71.1 | 60.8 | 65.2 | 55.3 | 57.7 | 68.0 | 62.3 | 65.1 | 55.1 | 57.7 |
| December | 71.4 | 62.1 | 66.1 | 56.8 | 59.0 | 68.5 | 63.5 | 65.9 | 56.5 | 59.0 |
| March | 72.2 | 64.0 | 67.7 | 58.4 | 60.6 | 69.7 | 65.3 | 67.4 | 58.1 | 60.6 |
| June | 73.4 | 65.7 | 69.2 | 60.2 | 62.4 | 71.2 | 66.9 | 69.0 | 60.0 | 62.3 |
| 1982-83 | | | | | | | | | | |
| September | 76.2 | 68.0 | 71.8 | 62.3 | 64.6 | 74.4 | 69.5 | 71.9 | 62.1 | 64.7 |
| December | 77.8 | 69.3 | 73.2 | 64.0 | 66.2 | 75.9 | 70.6 | 73.1 | 63.8 | 66.3 |
| March | 80.0 | 70.6 | 74.8 | 65.2 | 67.6 | 78.2 | 71.8 | 74.9 | 65.1 | 67.7 |
| June | 82.2 | 71.2 | 76.0 | 66.4 | 68.8 | 79.6 | 72.3 | 75.8 | 66.3 | 68.8 |
| 1983-84 | | | | | | | | | | |
| September | 81.0 | 71.8 | 75.9 | 66.8 | 69.0 | 78.7 | 73.0 | 75.7 | 66.7 | 69.1 |
| December | 79.9 | 72.5 | 75.8 | 68.1 | 70.1 | 77.7 | 73.8 | 75.7 | 68.1 | 70.1 |
| March | 79.8 | 73.1 | 76.1 | 68.9 | 70.7 | 77.4 | 74.4 | 75.8 | 68.8 | 70.7 |
| June | 80.2 | 73.8 | 76.7 | 69.9 | 71.6 | 78.0 | 75.1 | 76.5 | 69.7 | 71.5 |

*...continued*

## SECTORAL PRICE INDEXES *continued*

| Period | Chained Tornqvist Formula | | | | | Direct Laspeyres Formula | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | X | M | T | N | O | X | M | T | N | O |
| 1984-85 | | | | | | | | | | |
| September | 81.8 | 74.9 | 78.0 | 70.8 | 72.6 | 79.5 | 76.2 | 77.8 | 70.6 | 72.5 |
| December | 81.5 | 75.4 | 78.2 | 71.5 | 73.2 | 79.0 | 76.6 | 77.8 | 71.4 | 73.1 |
| March | 84.1 | 76.4 | 79.9 | 72.4 | 74.3 | 81.9 | 77.7 | 79.7 | 72.2 | 74.2 |
| June | 89.3 | 79.0 | 83.6 | 74.1 | 76.4 | 87.7 | 80.8 | 84.1 | 73.9 | 76.6 |
| 1985-86 | | | | | | | | | | |
| September | 88.4 | 80.8 | 84.3 | 75.4 | 77.7 | 87.0 | 82.9 | 84.9 | 75.3 | 77.8 |
| December | 88.3 | 81.3 | 84.5 | 76.7 | 78.7 | 86.7 | 82.9 | 84.7 | 76.5 | 78.7 |
| March | 87.5 | 82.7 | 84.9 | 77.9 | 79.6 | 85.8 | 83.9 | 84.8 | 77.7 | 79.5 |
| June | 82.1 | 78.9 | 80.4 | 78.1 | 78.7 | 80.5 | 78.7 | 79.6 | 78.0 | 78.4 |
| 1986-87 | | | | | | | | | | |
| September | 85.2 | 80.6 | 82.7 | 80.2 | 80.9 | 84.0 | 80.1 | 82.0 | 80.3 | 80.7 |
| December | 87.5 | 83.9 | 85.5 | 82.0 | 82.9 | 86.1 | 83.7 | 84.8 | 82.0 | 82.8 |
| March | 89.0 | 85.8 | 87.3 | 83.3 | 84.3 | 87.6 | 86.0 | 86.8 | 83.2 | 84.2 |
| June | 89.4 | 86.6 | 87.9 | 84.6 | 85.5 | 88.3 | 87.0 | 87.6 | 84.5 | 85.3 |
| 1987-88 | | | | | | | | | | |
| September | 91.0 | 87.9 | 89.3 | 85.8 | 86.7 | 90.2 | 88.2 | 89.2 | 85.7 | 86.6 |
| December | 92.2 | 89.2 | 90.6 | 86.7 | 87.7 | 91.5 | 89.7 | 90.6 | 86.6 | 87.6 |
| March | 94.3 | 90.7 | 92.4 | 88.1 | 89.2 | 94.3 | 91.1 | 92.6 | 88.0 | 89.2 |
| June | 94.1 | 91.6 | 92.8 | 89.8 | 90.6 | 94.7 | 91.8 | 93.2 | 89.7 | 90.6 |
| 1988-89 | | | | | | | | | | |
| September | 93.6 | 91.9 | 92.7 | 91.6 | 91.9 | 94.0 | 92.0 | 92.9 | 91.6 | 92.0 |
| December | 92.0 | 92.0 | 92.0 | 93.2 | 92.9 | 92.7 | 92.3 | 92.5 | 93.2 | 93.0 |
| March | 94.4 | 92.8 | 93.6 | 94.6 | 94.3 | 94.8 | 93.1 | 93.9 | 94.6 | 94.4 |
| June | 98.6 | 95.8 | 97.2 | 96.4 | 96.6 | 98.8 | 95.9 | 97.3 | 96.4 | 96.7 |
| 1989-90 | | | | | | | | | | |
| September | 99.4 | 97.7 | 98.5 | 98.1 | 98.2 | 99.4 | 97.7 | 98.5 | 98.1 | 98.2 |
| December | 99.3 | 98.8 | 99.0 | 99.5 | 99.4 | 99.2 | 98.8 | 99.0 | 99.5 | 99.4 |
| March | 100.7 | 101.4 | 101.1 | 100.7 | 100.8 | 100.7 | 101.4 | 101.1 | 100.7 | 100.8 |
| June | 100.7 | 102.1 | 101.4 | 101.7 | 101.6 | 100.7 | 102.1 | 101.4 | 101.7 | 101.6 |
| 1990-91 | | | | | | | | | | |
| September | 100.5 | 104.5 | 102.6 | 102.8 | 102.8 | 101.1 | 104.6 | 102.9 | 102.8 | 102.9 |
| December | 104.7 | 109.5 | 107.2 | 104.5 | 105.2 | 106.3 | 110.7 | 108.6 | 104.6 | 105.6 |
| March | 98.4 | 106.9 | 102.8 | 104.5 | 104.1 | 99.7 | 107.1 | 103.5 | 104.6 | 104.3 |
| June | 95.9 | 105.9 | 100.9 | 104.8 | 103.7 | 97.0 | 105.9 | 101.6 | 104.8 | 104.0 |
| 1991-92 | | | | | | | | | | |
| September | 96.5 | 106.5 | 101.6 | 105.7 | 104.6 | 97.6 | 106.7 | 102.3 | 105.8 | 104.9 |
| December | 96.3 | 106.9 | 101.7 | 106.3 | 105.1 | 97.8 | 107.2 | 102.7 | 106.4 | 105.4 |
| March | 97.7 | 106.5 | 102.2 | 106.4 | 105.3 | 98.5 | 106.7 | 102.7 | 106.5 | 105.5 |
| June | 98.1 | 107.4 | 102.8 | 106.4 | 105.4 | 99.0 | 107.6 | 103.5 | 106.5 | 105.7 |
| 1992-93 | | | | | | | | | | |
| September | 100.1 | 109.0 | 104.6 | 106.6 | 106.1 | 101.2 | 109.4 | 105.5 | 106.7 | 106.4 |
| December | 100.5 | 109.4 | 105.1 | 106.8 | 106.4 | 101.9 | 109.8 | 106.0 | 107.0 | 106.7 |
| March | 99.6 | 109.6 | 104.7 | 107.3 | 106.6 | 101.1 | 109.9 | 105.7 | 107.4 | 106.9 |
| June | 98.3 | 110.2 | 104.3 | 107.6 | 106.7 | 99.9 | 110.6 | 105.4 | 107.7 | 107.1 |
| 1993-94 | | | | | | | | | | |
| September | 98.9 | 109.5 | 104.3 | 108.7 | 107.5 | 100.4 | 109.8 | 105.3 | 108.8 | 107.9 |
| December | 97.8 | 109.6 | 103.8 | 109.3 | 107.8 | 99.3 | 109.9 | 104.8 | 109.4 | 108.2 |
| March | 96.0 | 107.8 | 102.0 | 109.5 | 107.4 | 96.9 | 108.2 | 102.8 | 109.6 | 107.8 |
| June | 96.2 | 109.3 | 102.8 | 109.6 | 107.7 | 96.9 | 109.7 | 103.5 | 109.7 | 108.1 |
| 1994-95 | | | | | | | | | | |
| September | 98.7 | 109.2 | 104.0 | 110.3 | 108.6 | 99.2 | 109.6 | 104.6 | 110.5 | 108.9 |
| December | 99.0 | 109.2 | 104.2 | 110.8 | 109.0 | 99.4 | 109.6 | 104.7 | 110.9 | 109.3 |
| March | 101.9 | 110.4 | 106.2 | 111.7 | 110.3 | 102.2 | 110.8 | 106.7 | 111.9 | 110.5 |
| June | 104.9 | 112.0 | 108.6 | 112.6 | 111.5 | 105.2 | 112.4 | 108.9 | 112.8 | 111.8 |

Note: X denotes the exportable sector, M the importable sector, T the tradable sector, N the non-tradable sector and O the overall economy.

# APPENDIX 4

## 28 AGGREGATE INDUSTRY PRICE INDEXES
## (Base year: 1989-90=100.0)

| Period | IOIC 28 level industry code | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| **ANNUAL** | | | | | | | | | | | | | | |
| 1977-78 | 40.1 | 26.0 | 46.4 | 36.1 | 40.7 | 31.7 | 42.1 | 45.1 | 36.2 | 37.6 | 38.8 | 39.2 | 37.3 | 38.7 |
| 1978-79 | 50.9 | 27.2 | 53.6 | 46.4 | 43.0 | 34.1 | 44.5 | 47.7 | 38.5 | 39.8 | 41.3 | 52.8 | 40.5 | 42.9 |
| 1979-80 | 61.8 | 34.3 | 70.3 | 56.6 | 49.0 | 37.8 | 49.8 | 51.0 | 43.4 | 44.1 | 48.2 | 82.0 | 45.0 | 50.8 |
| 1980-81 | 66.8 | 40.9 | 77.2 | 58.8 | 57.0 | 42.7 | 54.7 | 55.2 | 49.4 | 50.1 | 54.4 | 101.7 | 50.8 | 52.4 |
| 1981-82 | 66.4 | 42.0 | 82.6 | 60.8 | 58.7 | 49.4 | 58.4 | 59.5 | 53.7 | 57.2 | 59.0 | 111.0 | 57.7 | 55.3 |
| 1982-83 | 70.9 | 43.1 | 96.0 | 66.4 | 62.9 | 56.4 | 61.7 | 63.0 | 59.5 | 64.7 | 64.6 | 123.7 | 65.1 | 60.9 |
| 1983-84 | 73.5 | 45.4 | 93.3 | 70.8 | 68.0 | 63.6 | 65.8 | 66.3 | 64.1 | 68.2 | 69.3 | 122.7 | 69.6 | 64.8 |
| 1984-85 | 74.6 | 49.5 | 98.4 | 74.7 | 71.3 | 68.7 | 69.2 | 69.9 | 69.6 | 73.3 | 72.4 | 129.0 | 74.1 | 67.6 |
| 1985-86 | 75.3 | 62.5 | 102.7 | 77.6 | 77.2 | 73.9 | 74.9 | 74.7 | 74.5 | 78.3 | 77.9 | 125.9 | 77.4 | 69.4 |
| 1986-87 | 80.5 | 75.6 | 96.0 | 84.0 | 81.8 | 80.1 | 83.1 | 80.8 | 79.6 | 85.5 | 83.5 | 96.0 | 81.6 | 74.9 |
| 1987-88 | 92.4 | 83.0 | 94.2 | 89.2 | 86.2 | 86.9 | 93.2 | 86.3 | 84.9 | 91.9 | 90.5 | 99.7 | 86.9 | 84.7 |
| 1988-89 | 102.3 | 93.2 | 89.0 | 94.3 | 93.9 | 93.4 | 97.7 | 93.0 | 93.2 | 96.2 | 97.4 | 84.0 | 93.1 | 95.4 |
| 1989-90 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1990-91 | 85.8 | 98.7 | 111.1 | 100.9 | 102.7 | 106.0 | 101.1 | 104.5 | 105.1 | 105.3 | 104.2 | 127.0 | 107.2 | 102.4 |
| 1991-92 | 86.8 | 101.4 | 104.1 | 102.5 | 105.8 | 110.0 | 100.6 | 107.3 | 106.2 | 108.9 | 104.2 | 113.7 | 109.5 | 96.6 |
| 1992-93 | 84.9 | 109.8 | 108.8 | 105.8 | 110.0 | 114.1 | 100.2 | 108.4 | 109.0 | 110.7 | 105.4 | 121.8 | 110.4 | 97.3 |
| 1993-94 | 88.5 | 120.6 | 101.4 | 108.7 | 114.8 | 121.1 | 100.9 | 109.4 | 115.9 | 110.5 | 104.8 | 107.7 | 111.2 | 96.6 |
| 1994-95 | 102.1 | 114.6 | 99.2 | 107.7 | 119.7 | 124.9 | 103.8 | 110.6 | 119.4 | 113.7 | 108.1 | 102.3 | 113.9 | 103.6 |
| **QUARTERLY** | | | | | | | | | | | | | | |
| 1976-77 | | | | | | | | | | | | | | |
| March | 39.9 | 27.0 | 43.4 | 33.9 | 37.8 | 29.5 | 39.5 | 42.1 | 34.5 | 34.4 | 36.1 | 35.0 | 34.8 | 37.4 |
| June | 39.5 | 27.7 | 45.0 | 34.3 | 39.0 | 30.0 | 40.7 | 42.9 | 35.2 | 35.4 | 37.1 | 34.8 | 35.2 | 38.0 |
| 1977-78 | | | | | | | | | | | | | | |
| September | 38.9 | 27.0 | 45.6 | 34.0 | 40.1 | 30.6 | 41.5 | 44.2 | 35.7 | 36.0 | 37.5 | 36.1 | 36.0 | 38.1 |
| December | 39.3 | 25.8 | 46.8 | 34.6 | 40.4 | 31.7 | 42.0 | 44.9 | 36.0 | 37.4 | 38.2 | 39.8 | 36.9 | 38.7 |
| March | 40.6 | 25.2 | 46.7 | 36.6 | 40.7 | 32.2 | 42.3 | 45.4 | 36.2 | 38.2 | 39.5 | 40.2 | 37.7 | 38.8 |
| June | 41.5 | 26.2 | 46.6 | 39.0 | 41.4 | 32.6 | 42.6 | 45.9 | 37.0 | 38.7 | 40.1 | 40.8 | 38.5 | 39.3 |
| 1978-79 | | | | | | | | | | | | | | |
| September | 46.5 | 26.8 | 49.5 | 40.5 | 42.0 | 33.0 | 43.4 | 47.1 | 37.4 | 39.1 | 40.1 | 43.3 | 39.0 | 40.1 |
| December | 48.6 | 26.1 | 52.1 | 43.1 | 42.3 | 33.8 | 44.0 | 47.3 | 37.8 | 39.5 | 40.8 | 52.2 | 39.9 | 41.2 |
| March | 52.6 | 27.1 | 54.8 | 47.5 | 43.2 | 34.4 | 44.8 | 47.9 | 38.8 | 39.9 | 41.4 | 55.5 | 40.9 | 43.9 |
| June | 56.0 | 28.9 | 58.1 | 54.3 | 44.3 | 35.3 | 46.0 | 48.5 | 39.9 | 40.5 | 42.9 | 60.2 | 42.2 | 46.3 |
| 1979-80 | | | | | | | | | | | | | | |
| September | 59.4 | 31.1 | 62.7 | 55.4 | 46.1 | 36.3 | 47.4 | 49.7 | 40.9 | 41.4 | 45.2 | 71.4 | 43.5 | 48.1 |
| December | 61.9 | 33.1 | 67.0 | 56.5 | 47.7 | 37.2 | 48.9 | 50.4 | 42.2 | 43.3 | 47.2 | 75.3 | 44.1 | 49.9 |
| March | 63.7 | 36.0 | 77.0 | 57.8 | 49.8 | 38.4 | 50.5 | 51.4 | 44.3 | 44.9 | 49.3 | 87.7 | 45.4 | 53.6 |
| June | 62.3 | 37.1 | 74.6 | 56.7 | 52.3 | 39.3 | 52.3 | 52.3 | 46.3 | 46.6 | 51.2 | 93.4 | 46.9 | 51.4 |
| 1980-81 | | | | | | | | | | | | | | |
| September | 64.4 | 37.7 | 76.5 | 57.8 | 54.9 | 41.0 | 53.2 | 53.5 | 47.9 | 48.3 | 52.8 | 95.7 | 48.6 | 52.1 |
| December | 67.1 | 40.0 | 76.7 | 58.8 | 56.8 | 42.0 | 53.8 | 54.2 | 48.8 | 49.5 | 53.9 | 97.5 | 50.0 | 52.4 |
| March | 68.1 | 42.2 | 76.9 | 59.2 | 58.1 | 43.2 | 55.3 | 56.0 | 49.9 | 50.7 | 54.8 | 104.6 | 51.7 | 52.2 |
| June | 67.5 | 43.9 | 78.8 | 59.5 | 58.3 | 44.7 | 56.3 | 57.1 | 50.8 | 52.1 | 56.0 | 108.9 | 53.1 | 52.9 |
| 1981-82 | | | | | | | | | | | | | | |
| September | 68.8 | 41.7 | 80.4 | 60.3 | 57.8 | 47.0 | 57.5 | 58.2 | 51.4 | 54.3 | 57.1 | 108.7 | 55.0 | 54.0 |
| December | 66.3 | 42.0 | 81.4 | 60.6 | 58.2 | 48.5 | 57.9 | 58.6 | 52.4 | 56.4 | 58.2 | 109.6 | 56.4 | 54.5 |
| March | 65.1 | 42.6 | 83.2 | 60.4 | 59.2 | 50.4 | 58.7 | 60.1 | 54.5 | 58.3 | 59.5 | 112.0 | 58.5 | 55.8 |
| June | 65.5 | 41.7 | 85.6 | 62.2 | 59.8 | 51.9 | 59.4 | 60.9 | 56.5 | 59.9 | 61.1 | 113.8 | 60.8 | 56.8 |
| 1982-83 | | | | | | | | | | | | | | |
| September | 68.2 | 42.2 | 92.2 | 63.1 | 60.4 | 54.6 | 60.4 | 61.9 | 58.0 | 62.7 | 62.5 | 122.6 | 63.1 | 58.2 |
| December | 68.4 | 42.5 | 95.2 | 64.8 | 62.1 | 55.1 | 61.1 | 62.3 | 59.0 | 64.2 | 63.8 | 123.3 | 64.5 | 59.8 |
| March | 70.3 | 43.2 | 98.9 | 65.6 | 63.8 | 56.9 | 61.9 | 63.6 | 59.9 | 65.4 | 65.1 | 125.7 | 66.1 | 61.3 |
| June | 76.6 | 44.6 | 97.5 | 72.1 | 65.5 | 59.2 | 63.4 | 64.1 | 61.2 | 66.5 | 66.9 | 123.1 | 66.6 | 64.1 |
| 1983-84 | | | | | | | | | | | | | | |
| September | 74.3 | 45.5 | 96.3 | 71.0 | 67.1 | 60.8 | 64.5 | 65.0 | 62.0 | 67.0 | 68.0 | 123.1 | 67.2 | 64.7 |
| December | 73.2 | 45.1 | 93.8 | 70.1 | 67.7 | 63.8 | 65.4 | 65.6 | 63.1 | 67.8 | 68.8 | 123.6 | 68.9 | 64.3 |
| March | 73.9 | 45.2 | 91.6 | 70.6 | 68.5 | 64.1 | 66.3 | 67.0 | 65.0 | 68.2 | 69.9 | 122.3 | 70.5 | 64.2 |
| June | 72.5 | 45.9 | 91.4 | 71.4 | 68.9 | 65.6 | 67.2 | 67.7 | 66.5 | 70.0 | 70.4 | 122.0 | 71.9 | 65.9 |

. . . continued

## 28 AGGREGATE INDUSTRY PRICE INDEXES *continued*

| Period | IOIC 28 level industry code | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 1984-85 | | | | | | | | | | | | | | |
| September | 73.9 | 47.1 | 93.7 | 73.1 | 70.3 | 66.7 | 67.9 | 69.0 | 67.8 | 71.9 | 70.8 | 123.8 | 73.0 | 66.5 |
| December | 74.6 | 47.9 | 93.1 | 74.1 | 70.5 | 68.9 | 68.4 | 69.4 | 69.1 | 72.8 | 71.8 | 123.9 | 73.8 | 65.6 |
| March | 74.1 | 49.6 | 98.2 | 74.9 | 71.1 | 69.4 | 69.4 | 70.3 | 69.9 | 73.6 | 72.9 | 127.5 | 74.4 | 67.3 |
| June | 75.7 | 53.3 | 108.8 | 76.6 | 73.4 | 70.0 | 71.0 | 71.0 | 71.3 | 74.7 | 74.3 | 140.9 | 75.3 | 70.9 |
| 1985-86 | | | | | | | | | | | | | | |
| September | 74.5 | 57.5 | 108.6 | 76.5 | 75.1 | 72.3 | 73.2 | 72.8 | 72.8 | 76.2 | 76.0 | 146.1 | 76.3 | 70.2 |
| December | 74.5 | 61.7 | 108.3 | 78.0 | 76.2 | 72.5 | 74.4 | 73.5 | 73.7 | 77.2 | 77.1 | 138.3 | 76.8 | 69.6 |
| March | 75.6 | 64.9 | 105.1 | 78.2 | 77.6 | 74.7 | 75.5 | 75.6 | 75.2 | 79.3 | 78.6 | 133.6 | 77.9 | 68.7 |
| June | 76.8 | 66.0 | 88.7 | 77.8 | 79.9 | 76.0 | 76.8 | 76.9 | 76.6 | 80.5 | 80.0 | 85.7 | 78.8 | 69.2 |
| 1986-87 | | | | | | | | | | | | | | |
| September | 79.6 | 73.0 | 92.8 | 81.4 | 81.0 | 77.6 | 78.8 | 79.1 | 77.9 | 82.4 | 81.2 | 82.5 | 79.8 | 74.0 |
| December | 79.6 | 77.0 | 96.7 | 84.1 | 81.4 | 79.3 | 82.5 | 80.1 | 79.5 | 84.9 | 82.7 | 95.5 | 80.9 | 75.1 |
| March | 80.2 | 76.0 | 98.4 | 84.9 | 82.0 | 81.0 | 84.2 | 81.6 | 79.8 | 86.4 | 84.5 | 103.1 | 82.4 | 74.3 |
| June | 82.5 | 76.5 | 96.0 | 85.4 | 82.6 | 82.5 | 86.7 | 82.6 | 81.4 | 88.3 | 85.6 | 103.0 | 83.4 | 76.3 |
| 1987-88 | | | | | | | | | | | | | | |
| September | 88.0 | 80.1 | 95.4 | 87.1 | 83.8 | 84.3 | 89.5 | 83.8 | 82.5 | 89.7 | 87.3 | 101.6 | 85.4 | 79.6 |
| December | 87.9 | 81.1 | 96.1 | 88.1 | 84.8 | 85.9 | 92.0 | 85.0 | 83.5 | 90.8 | 89.3 | 102.1 | 86.3 | 83.5 |
| March | 94.1 | 85.0 | 94.6 | 90.3 | 87.1 | 87.5 | 94.5 | 87.4 | 85.4 | 92.8 | 91.6 | 101.0 | 87.1 | 87.2 |
| June | 99.5 | 85.8 | 90.9 | 91.1 | 89.1 | 89.8 | 97.0 | 89.1 | 88.2 | 94.3 | 93.8 | 94.1 | 89.0 | 88.7 |
| 1988-89 | | | | | | | | | | | | | | |
| September | 104.5 | 90.2 | 88.2 | 92.9 | 91.3 | 91.4 | 97.3 | 90.7 | 90.0 | 94.9 | 95.6 | 85.0 | 90.7 | 90.4 |
| December | 101.5 | 92.6 | 84.5 | 92.1 | 93.3 | 92.8 | 97.9 | 91.6 | 92.1 | 95.9 | 97.4 | 79.4 | 92.2 | 92.5 |
| March | 100.8 | 96.0 | 87.5 | 94.4 | 94.7 | 94.0 | 97.4 | 93.9 | 94.1 | 96.5 | 98.0 | 79.3 | 93.7 | 97.4 |
| June | 102.4 | 94.1 | 95.7 | 97.9 | 96.3 | 95.5 | 98.0 | 95.9 | 96.4 | 97.3 | 98.6 | 92.1 | 95.6 | 101.2 |
| 1989-90 | | | | | | | | | | | | | | |
| September | 102.7 | 101.6 | 98.4 | 99.1 | 98.0 | 97.3 | 98.4 | 97.7 | 97.8 | 97.9 | 98.7 | 94.7 | 97.6 | 100.5 |
| December | 100.1 | 102.3 | 99.3 | 100.4 | 99.1 | 99.5 | 99.8 | 98.6 | 99.0 | 98.9 | 99.8 | 95.2 | 99.2 | 97.5 |
| March | 98.3 | 99.9 | 101.9 | 99.2 | 100.7 | 101.1 | 100.8 | 101.5 | 100.5 | 100.9 | 100.2 | 105.8 | 100.9 | 97.7 |
| June | 99.0 | 96.2 | 100.4 | 101.3 | 102.2 | 102.1 | 101.0 | 102.3 | 102.8 | 102.3 | 101.2 | 104.3 | 102.4 | 104.4 |
| 1990-91 | | | | | | | | | | | | | | |
| September | 89.2 | 97.5 | 108.6 | 100.8 | 103.0 | 103.9 | 101.1 | 103.1 | 103.4 | 103.0 | 101.5 | 119.0 | 104.7 | 103.6 |
| December | 86.5 | 98.6 | 121.9 | 100.8 | 103.0 | 105.6 | 101.3 | 103.4 | 104.7 | 105.4 | 102.7 | 157.1 | 106.5 | 105.0 |
| March | 84.5 | 97.5 | 109.8 | 101.2 | 102.0 | 106.5 | 101.5 | 105.2 | 105.7 | 106.0 | 106.3 | 122.3 | 108.3 | 101.1 |
| June | 83.0 | 101.2 | 104.1 | 100.8 | 102.9 | 107.9 | 100.4 | 106.1 | 106.5 | 106.8 | 106.3 | 109.5 | 109.2 | 99.7 |
| 1991-92 | | | | | | | | | | | | | | |
| September | 86.4 | 103.5 | 103.4 | 101.4 | 104.2 | 108.8 | 100.7 | 106.7 | 105.9 | 108.2 | 104.5 | 113.8 | 109.4 | 97.7 |
| December | 84.9 | 100.9 | 105.4 | 102.0 | 105.3 | 110.1 | 99.9 | 107.4 | 105.3 | 109.1 | 104.2 | 115.5 | 109.7 | 96.2 |
| March | 89.2 | 99.1 | 103.4 | 103.7 | 106.0 | 110.1 | 100.8 | 107.6 | 106.5 | 108.9 | 103.8 | 110.9 | 109.4 | 96.2 |
| June | 86.8 | 102.2 | 104.2 | 103.0 | 107.6 | 110.9 | 100.9 | 107.5 | 107.3 | 109.6 | 104.1 | 114.4 | 109.6 | 96.3 |
| 1992-93 | | | | | | | | | | | | | | |
| September | 84.8 | 105.3 | 109.3 | 103.4 | 109.1 | 111.7 | 100.6 | 108.1 | 107.6 | 110.1 | 104.9 | 123.2 | 110.1 | 98.7 |
| December | 85.9 | 108.8 | 110.4 | 105.8 | 109.9 | 112.9 | 100.0 | 108.3 | 107.9 | 110.7 | 105.6 | 122.4 | 110.3 | 97.7 |
| March | 85.9 | 110.4 | 108.6 | 107.6 | 109.8 | 115.0 | 100.3 | 108.5 | 109.3 | 110.9 | 105.9 | 119.6 | 110.3 | 96.8 |
| June | 83.0 | 114.8 | 107.0 | 106.2 | 111.3 | 116.7 | 100.0 | 108.7 | 111.3 | 111.0 | 105.3 | 121.8 | 110.8 | 95.9 |
| 1993-94 | | | | | | | | | | | | | | |
| September | 86.9 | 124.0 | 106.5 | 110.1 | 114.0 | 118.8 | 100.3 | 109.2 | 113.6 | 110.5 | 104.9 | 113.8 | 110.8 | 97.6 |
| December | 87.2 | 125.7 | 104.0 | 109.4 | 114.5 | 120.8 | 100.5 | 109.1 | 115.0 | 110.5 | 104.9 | 112.9 | 111.0 | 96.7 |
| March | 89.1 | 117.1 | 98.3 | 107.6 | 115.1 | 121.8 | 100.8 | 109.5 | 116.8 | 110.3 | 104.9 | 97.9 | 111.1 | 96.0 |
| June | 90.9 | 115.6 | 96.8 | 107.8 | 115.4 | 123.3 | 102.0 | 109.8 | 118.2 | 110.8 | 104.7 | 106.0 | 112.0 | 95.9 |
| 1994-95 | | | | | | | | | | | | | | |
| September | 98.5 | 116.0 | 97.7 | 106.3 | 116.5 | 123.8 | 102.8 | 110.1 | 118.3 | 111.8 | 105.3 | 102.5 | 113.0 | 98.1 |
| December | 99.8 | 116.3 | 96.1 | 106.9 | 118.2 | 124.1 | 103.2 | 110.5 | 119.0 | 112.6 | 107.1 | 98.8 | 113.8 | 101.8 |
| March | 103.9 | 114.2 | 99.3 | 107.9 | 121.5 | 125.7 | 104.0 | 110.5 | 119.7 | 114.3 | 108.9 | 102.0 | 114.2 | 106.2 |
| June | 106.5 | 111.8 | 103.7 | 109.8 | 122.4 | 126.1 | 105.1 | 111.3 | 120.4 | 116.0 | 111.2 | 105.9 | 114.7 | 108.1 |

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## 28 AGGREGATE INDUSTRY PRICE INDEXES *continued*
## (Base year: 1989-90=100.0)

| Period | IOIC 28 level industry code | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| **ANNUAL** | | | | | | | | | | | | | | |
| 1977-78 | 38.2 | 35.6 | 41.2 | 38.8 | 34.1 | 35.6 | 38.7 | 40.1 | 48.5 | 37.0 | 35.0 | 51.1 | 41.4 | 36.7 |
| 1978-79 | 41.1 | 38.7 | 44.4 | 41.8 | 36.9 | 37.7 | 45.4 | 42.5 | 51.6 | 40.2 | 38.5 | 52.5 | 43.6 | 39.5 |
| 1979-80 | 46.2 | 42.3 | 49.9 | 49.1 | 39.9 | 41.6 | 54.9 | 45.7 | 56.4 | 43.5 | 42.0 | 60.2 | 47.8 | 43.4 |
| 1980-81 | 53.1 | 46.3 | 55.0 | 53.7 | 44.7 | 46.7 | 60.1 | 49.0 | 58.4 | 47.7 | 46.0 | 66.9 | 53.4 | 48.0 |
| 1981-82 | 59.2 | 51.1 | 60.4 | 57.2 | 52.8 | 52.7 | 63.3 | 55.0 | 71.4 | 51.3 | 51.0 | 73.1 | 60.0 | 53.4 |
| 1982-83 | 64.8 | 56.7 | 66.6 | 61.6 | 66.6 | 59.3 | 69.4 | 62.5 | 78.7 | 58.9 | 56.9 | 78.0 | 66.5 | 59.8 |
| 1983-84 | 69.1 | 60.7 | 70.4 | 66.6 | 72.5 | 62.5 | 72.9 | 66.1 | 78.4 | 65.7 | 61.2 | 76.2 | 69.8 | 64.5 |
| 1984-85 | 72.5 | 63.9 | 73.7 | 69.9 | 76.3 | 66.4 | 76.3 | 69.2 | 82.3 | 68.7 | 65.9 | 79.4 | 74.0 | 68.4 |
| 1985-86 | 76.8 | 70.2 | 78.7 | 75.4 | 79.6 | 72.9 | 81.2 | 73.3 | 87.7 | 72.5 | 71.4 | 83.7 | 78.4 | 73.9 |
| 1986-87 | 81.6 | 80.6 | 85.2 | 81.9 | 84.2 | 78.0 | 84.6 | 80.9 | 95.5 | 79.1 | 77.2 | 88.0 | 84.2 | 79.5 |
| 1987-88 | 86.0 | 88.9 | 91.1 | 89.8 | 88.8 | 83.3 | 90.0 | 87.3 | 97.6 | 83.2 | 84.7 | 91.6 | 88.9 | 85.5 |
| 1988-89 | 92.8 | 94.8 | 96.5 | 97.0 | 94.2 | 91.9 | 93.8 | 93.3 | 98.1 | 92.5 | 93.1 | 96.1 | 94.4 | 92.8 |
| 1989-90 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1990-91 | 105.4 | 103.8 | 102.3 | 102.5 | 105.1 | 102.5 | 104.6 | 106.9 | 101.2 | 101.8 | 104.9 | 104.4 | 106.7 | 106.8 |
| 1991-92 | 106.1 | 106.6 | 101.8 | 104.0 | 109.1 | 100.7 | 104.3 | 109.7 | 103.3 | 104.9 | 107.4 | 107.1 | 110.4 | 111.0 |
| 1992-93 | 106.3 | 109.8 | 103.6 | 105.2 | 111.0 | 99.8 | 107.4 | 110.5 | 105.2 | 103.3 | 107.8 | 108.5 | 112.1 | 113.7 |
| 1993-94 | 106.3 | 113.0 | 104.2 | 106.9 | 112.8 | 101.1 | 107.5 | 110.9 | 102.6 | 110.4 | 108.8 | 111.3 | 113.1 | 115.1 |
| 1994-95 | 107.2 | 115.1 | 104.8 | 109.6 | 112.9 | 103.3 | 110.7 | 111.7 | 102.3 | 113.7 | 109.9 | 113.6 | 114.4 | 117.4 |
| **QUARTERLY** | | | | | | | | | | | | | | |
| 1976-77 | | | | | | | | | | | | | | |
| March | 35.3 | 33.1 | 39.2 | 36.1 | 32.9 | 33.3 | 36.3 | 37.5 | 50.0 | 35.5 | 31.9 | 47.8 | 38.8 | 33.4 |
| June | 35.9 | 33.9 | 40.0 | 37.1 | 32.6 | 34.2 | 37.4 | 38.6 | 49.6 | 36.3 | 32.8 | 48.8 | 39.8 | 34.4 |
| 1977-78 | | | | | | | | | | | | | | |
| September | 37.2 | 34.6 | 40.3 | 37.9 | 32.6 | 34.9 | 37.8 | 39.2 | 48.4 | 36.3 | 33.6 | 49.9 | 40.4 | 35.5 |
| December | 37.9 | 35.2 | 40.8 | 38.5 | 33.5 | 35.4 | 38.1 | 39.9 | 48.2 | 36.5 | 34.7 | 50.9 | 40.9 | 36.8 |
| March | 38.4 | 35.8 | 41.6 | 39.1 | 34.7 | 35.9 | 39.0 | 40.4 | 48.3 | 37.2 | 35.4 | 51.6 | 41.9 | 36.9 |
| June | 39.1 | 36.8 | 42.2 | 39.8 | 35.5 | 36.3 | 40.1 | 40.8 | 49.0 | 37.9 | 36.2 | 51.9 | 42.4 | 37.5 |
| 1978-79 | | | | | | | | | | | | | | |
| September | 40.1 | 37.6 | 42.9 | 40.3 | 35.6 | 36.6 | 42.1 | 41.5 | 50.3 | 39.1 | 37.1 | 51.2 | 42.7 | 38.2 |
| December | 40.5 | 38.3 | 43.8 | 40.8 | 36.6 | 37.4 | 43.6 | 41.9 | 51.1 | 39.9 | 38.2 | 51.6 | 43.0 | 39.3 |
| March | 41.5 | 39.1 | 44.9 | 42.2 | 37.5 | 38.1 | 46.2 | 42.8 | 51.9 | 40.7 | 39.0 | 52.7 | 44.1 | 39.8 |
| June | 42.1 | 39.6 | 45.8 | 44.0 | 37.8 | 38.8 | 49.9 | 43.6 | 53.0 | 41.1 | 39.8 | 54.6 | 44.6 | 40.5 |
| 1979-80 | | | | | | | | | | | | | | |
| September | 43.6 | 40.7 | 47.0 | 46.5 | 38.2 | 39.8 | 51.6 | 44.8 | 54.8 | 41.9 | 40.7 | 57.4 | 45.8 | 41.6 |
| December | 44.9 | 41.8 | 48.9 | 48.4 | 39.5 | 40.7 | 53.7 | 45.3 | 56.2 | 42.7 | 41.6 | 59.3 | 47.0 | 43.0 |
| March | 47.5 | 42.9 | 51.1 | 50.2 | 40.8 | 42.3 | 57.1 | 45.9 | 57.0 | 44.3 | 42.3 | 61.1 | 48.5 | 44.2 |
| June | 48.7 | 43.7 | 52.4 | 51.3 | 41.2 | 43.4 | 57.0 | 46.9 | 57.8 | 44.9 | 43.3 | 62.8 | 49.7 | 44.9 |
| 1980-81 | | | | | | | | | | | | | | |
| September | 51.2 | 44.7 | 53.4 | 52.4 | 42.3 | 44.9 | 59.0 | 47.5 | 56.6 | 46.4 | 44.4 | 64.4 | 51.0 | 45.9 |
| December | 52.2 | 45.8 | 54.4 | 53.2 | 43.7 | 45.9 | 59.5 | 48.4 | 57.1 | 47.3 | 45.3 | 66.1 | 52.7 | 47.5 |
| March | 53.8 | 46.7 | 55.6 | 54.0 | 46.0 | 47.3 | 60.8 | 49.4 | 58.7 | 48.1 | 46.4 | 67.8 | 54.4 | 48.9 |
| June | 55.2 | 48.1 | 56.8 | 55.2 | 46.9 | 48.7 | 61.3 | 50.6 | 61.4 | 49.1 | 47.7 | 69.3 | 55.6 | 49.6 |
| 1981-82 | | | | | | | | | | | | | | |
| September | 56.7 | 49.1 | 58.3 | 56.2 | 48.0 | 50.2 | 62.1 | 52.1 | 66.7 | 49.1 | 48.9 | 71.0 | 56.9 | 51.0 |
| December | 57.8 | 50.0 | 59.2 | 56.4 | 50.7 | 51.3 | 62.4 | 54.1 | 70.5 | 50.2 | 50.3 | 72.5 | 59.5 | 52.6 |
| March | 60.0 | 51.8 | 61.0 | 57.3 | 55.5 | 53.4 | 63.4 | 55.3 | 73.3 | 52.2 | 51.6 | 73.9 | 60.4 | 54.4 |
| June | 62.0 | 53.3 | 63.1 | 59.0 | 56.8 | 55.7 | 65.2 | 58.5 | 74.9 | 53.7 | 53.2 | 75.1 | 63.3 | 55.6 |
| 1982-83 | | | | | | | | | | | | | | |
| September | 63.7 | 55.0 | 64.6 | 60.4 | 63.4 | 58.0 | 66.7 | 60.4 | 77.0 | 56.1 | 55.1 | 77.0 | 64.5 | 57.4 |
| December | 64.2 | 56.0 | 66.5 | 61.3 | 67.1 | 58.9 | 67.9 | 61.8 | 79.2 | 58.1 | 56.4 | 78.2 | 66.5 | 59.6 |
| March | 65.1 | 57.3 | 67.0 | 61.8 | 67.4 | 59.8 | 70.0 | 63.5 | 79.6 | 59.8 | 57.5 | 78.6 | 67.4 | 60.9 |
| June | 66.1 | 58.5 | 68.1 | 63.1 | 68.5 | 60.5 | 72.8 | 64.2 | 79.0 | 61.5 | 58.6 | 78.2 | 67.7 | 61.2 |
| 1983-84 | | | | | | | | | | | | | | |
| September | 67.3 | 59.5 | 68.9 | 64.6 | 69.9 | 61.0 | 72.6 | 64.9 | 76.9 | 63.2 | 59.5 | 76.2 | 67.7 | 62.1 |
| December | 68.7 | 60.2 | 70.2 | 66.1 | 72.6 | 62.1 | 72.6 | 65.5 | 78.5 | 65.5 | 60.5 | 75.8 | 69.3 | 64.6 |
| March | 69.5 | 61.3 | 70.9 | 67.2 | 73.4 | 62.9 | 72.9 | 66.6 | 78.7 | 66.5 | 61.7 | 76.0 | 70.2 | 65.6 |
| June | 70.9 | 61.9 | 71.6 | 68.2 | 74.3 | 64.1 | 73.3 | 67.4 | 79.4 | 67.7 | 62.9 | 76.8 | 72.1 | 65.7 |

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# 28 AGGREGATE INDUSTRY PRICE INDEXES *continued*

| Period | IOIC 28 level industry code | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 1984-85 | | | | | | | | | | | | | | |
| September | 71.7 | 62.9 | 72.8 | 68.8 | 75.1 | 64.7 | 74.4 | 68.1 | 80.6 | 67.9 | 64.4 | 78.0 | 73.0 | 66.6 |
| December | 72.2 | 63.3 | 73.1 | 69.3 | 76.2 | 65.7 | 74.4 | 68.8 | 81.3 | 68.3 | 65.3 | 78.8 | 73.6 | 68.0 |
| March | 72.7 | 63.7 | 73.5 | 69.9 | 76.6 | 66.8 | 76.1 | 69.4 | 82.8 | 68.6 | 66.3 | 79.8 | 74.1 | 69.1 |
| June | 73.6 | 65.7 | 75.4 | 71.7 | 77.4 | 68.2 | 80.2 | 70.5 | 84.4 | 70.0 | 67.5 | 80.9 | 75.5 | 70.0 |
| 1985-86 | | | | | | | | | | | | | | |
| September | 74.8 | 67.3 | 76.7 | 73.4 | 78.6 | 69.9 | 82.4 | 71.0 | 85.3 | 70.5 | 69.3 | 82.1 | 76.5 | 71.6 |
| December | 75.9 | 69.1 | 77.7 | 74.4 | 79.1 | 72.3 | 82.8 | 72.2 | 86.8 | 71.8 | 70.5 | 83.2 | 77.9 | 73.5 |
| March | 77.8 | 71.4 | 79.7 | 75.9 | 79.5 | 74.2 | 82.1 | 74.0 | 88.4 | 73.3 | 72.1 | 84.3 | 79.3 | 74.9 |
| June | 78.7 | 73.2 | 80.6 | 77.9 | 81.1 | 75.1 | 77.5 | 75.9 | 90.2 | 74.5 | 73.8 | 85.3 | 79.9 | 75.6 |
| 1986-87 | | | | | | | | | | | | | | |
| September | 80.0 | 76.2 | 82.7 | 79.7 | 82.7 | 76.4 | 81.1 | 78.1 | 93.3 | 76.6 | 75.4 | 86.5 | 82.0 | 76.9 |
| December | 80.9 | 79.7 | 85.1 | 81.5 | 83.9 | 77.7 | 84.3 | 79.8 | 95.6 | 78.3 | 76.1 | 87.5 | 83.5 | 79.1 |
| March | 82.3 | 82.3 | 86.0 | 82.4 | 84.2 | 78.2 | 86.1 | 81.9 | 96.6 | 79.8 | 77.7 | 88.5 | 84.9 | 80.4 |
| June | 83.2 | 84.1 | 87.0 | 84.0 | 85.9 | 79.8 | 86.9 | 83.9 | 96.7 | 81.7 | 79.5 | 89.4 | 86.1 | 81.9 |
| 1987-88 | | | | | | | | | | | | | | |
| September | 83.6 | 86.3 | 88.1 | 86.6 | 87.4 | 81.0 | 88.1 | 85.3 | 97.3 | 82.5 | 81.8 | 90.1 | 87.0 | 82.7 |
| December | 84.4 | 88.2 | 90.4 | 88.7 | 88.8 | 82.4 | 89.1 | 86.6 | 97.8 | 81.7 | 83.4 | 91.0 | 88.2 | 84.4 |
| March | 87.2 | 89.8 | 92.2 | 90.2 | 88.9 | 84.1 | 90.7 | 87.6 | 97.6 | 83.0 | 85.8 | 92.0 | 89.5 | 86.8 |
| June | 88.6 | 91.3 | 93.8 | 93.8 | 90.3 | 85.9 | 92.0 | 89.6 | 97.6 | 85.7 | 87.8 | 93.2 | 91.0 | 88.0 |
| 1988-89 | | | | | | | | | | | | | | |
| September | 90.4 | 93.2 | 94.6 | 96.0 | 92.7 | 88.1 | 92.3 | 91.1 | 97.5 | 89.0 | 89.9 | 94.5 | 92.3 | 89.6 |
| December | 92.3 | 94.3 | 96.3 | 97.0 | 94.1 | 90.6 | 91.9 | 92.6 | 98.3 | 91.7 | 92.0 | 95.6 | 94.3 | 92.3 |
| March | 93.5 | 95.3 | 96.9 | 97.2 | 94.6 | 93.2 | 93.6 | 94.3 | 98.3 | 93.6 | 94.3 | 96.7 | 94.9 | 93.8 |
| June | 95.3 | 96.2 | 97.9 | 97.7 | 95.4 | 95.5 | 97.4 | 95.0 | 98.2 | 95.6 | 96.1 | 97.7 | 96.2 | 95.3 |
| 1989-90 | | | | | | | | | | | | | | |
| September | 97.1 | 98.3 | 99.0 | 98.6 | 98.0 | 97.8 | 98.7 | 96.8 | 99.2 | 97.8 | 97.9 | 98.5 | 97.1 | 96.8 |
| December | 98.9 | 99.4 | 100.1 | 99.8 | 100.1 | 99.7 | 99.2 | 99.0 | 100.0 | 99.7 | 99.5 | 99.4 | 99.3 | 99.2 |
| March | 100.9 | 100.7 | 100.2 | 100.3 | 100.6 | 100.9 | 101.1 | 100.8 | 100.4 | 100.9 | 100.6 | 100.5 | 101.2 | 101.2 |
| June | 103.0 | 101.6 | 100.7 | 101.2 | 101.2 | 101.6 | 101.0 | 103.4 | 100.5 | 101.5 | 102.0 | 101.6 | 102.4 | 102.8 |
| 1990-91 | | | | | | | | | | | | | | |
| September | 104.3 | 102.6 | 101.1 | 101.6 | 103.9 | 102.2 | 103.0 | 105.0 | 101.0 | 101.3 | 103.5 | 103.0 | 104.3 | 103.8 |
| December | 105.2 | 103.7 | 102.3 | 101.8 | 105.4 | 102.9 | 108.5 | 106.5 | 101.1 | 101.4 | 104.7 | 104.1 | 106.2 | 106.6 |
| March | 105.6 | 104.4 | 102.8 | 103.1 | 105.2 | 102.7 | 104.2 | 107.8 | 101.2 | 101.9 | 105.3 | 105.0 | 107.8 | 108.2 |
| June | 106.4 | 104.8 | 102.9 | 103.6 | 106.1 | 102.2 | 102.8 | 108.4 | 101.4 | 102.7 | 106.3 | 105.7 | 108.5 | 108.6 |
| 1991-92 | | | | | | | | | | | | | | |
| September | 106.2 | 105.8 | 101.9 | 103.6 | 107.7 | 101.8 | 103.5 | 109.3 | 102.8 | 104.3 | 107.3 | 106.2 | 109.3 | 109.6 |
| December | 105.7 | 106.5 | 101.8 | 103.9 | 109.3 | 101.1 | 104.2 | 109.5 | 103.0 | 105.1 | 107.0 | 106.9 | 110.5 | 111.0 |
| March | 105.7 | 106.7 | 101.6 | 104.2 | 109.4 | 100.5 | 104.4 | 110.0 | 103.6 | 105.3 | 107.4 | 107.4 | 110.7 | 111.4 |
| June | 106.6 | 107.3 | 101.9 | 104.2 | 109.9 | 99.6 | 105.1 | 109.8 | 103.8 | 105.0 | 107.7 | 107.7 | 111.0 | 112.1 |
| 1992-93 | | | | | | | | | | | | | | |
| September | 106.5 | 108.5 | 102.7 | 104.6 | 110.2 | 100.1 | 106.9 | 110.2 | 105.0 | 102.9 | 107.7 | 107.8 | 111.2 | 112.9 |
| December | 106.1 | 109.0 | 103.5 | 105.3 | 110.9 | 99.8 | 107.5 | 110.2 | 105.6 | 102.3 | 107.7 | 108.1 | 111.9 | 113.2 |
| March | 106.3 | 110.2 | 104.3 | 105.7 | 110.6 | 100.0 | 107.6 | 110.9 | 105.5 | 103.1 | 107.7 | 108.7 | 112.4 | 114.2 |
| June | 106.3 | 111.4 | 104.0 | 105.4 | 112.1 | 99.2 | 107.5 | 110.8 | 104.7 | 104.8 | 107.9 | 109.4 | 112.7 | 114.5 |
| 1993-94 | | | | | | | | | | | | | | |
| September | 106.7 | 112.0 | 104.2 | 106.2 | 112.4 | 100.4 | 108.4 | 110.6 | 103.1 | 108.1 | 108.5 | 110.3 | 112.7 | 114.9 |
| December | 106.2 | 112.7 | 104.3 | 106.7 | 113.1 | 101.1 | 107.9 | 110.9 | 102.4 | 109.9 | 108.8 | 111.0 | 113.1 | 115.4 |
| March | 106.0 | 113.4 | 104.2 | 107.5 | 112.9 | 101.7 | 106.4 | 111.0 | 102.4 | 111.7 | 108.9 | 111.6 | 113.3 | 115.6 |
| June | 106.1 | 114.0 | 104.0 | 107.5 | 112.9 | 101.1 | 107.1 | 110.9 | 102.3 | 112.1 | 108.9 | 112.2 | 113.4 | 114.6 |
| 1994-95 | | | | | | | | | | | | | | |
| September | 105.8 | 114.7 | 104.1 | 108.0 | 111.6 | 103.0 | 108.4 | 111.8 | 102.3 | 112.5 | 109.6 | 112.7 | 113.9 | 115.3 |
| December | 106.3 | 114.6 | 104.5 | 109.0 | 112.8 | 102.8 | 108.8 | 111.9 | 102.5 | 113.1 | 109.6 | 113.3 | 114.0 | 116.7 |
| March | 107.7 | 114.7 | 105.2 | 109.9 | 113.6 | 103.3 | 111.3 | 111.6 | 102.3 | 113.9 | 109.8 | 113.9 | 114.6 | 118.6 |
| June | 109.1 | 116.3 | 105.3 | 111.7 | 113.5 | 104.0 | 114.3 | 111.6 | 102.1 | 115.1 | 110.5 | 114.5 | 114.9 | 119.0 |

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